Supplementary Online Content

Beckley AL, Caspi A, Broadbent J, et al. Association of childhood blood lead levels with criminal offending. *JAMA Pediatr.* Published online December 26, 2017. doi:10.1001/jamapediatrics.2017.4005

This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Descriptive Statistics of Full-Scale Self-Reported Offending Variety and Associations of Blood Lead Level With Self-Reported Offending

Measure	Descriptive statistics N=553	Descriptive statistics by blood lead level (BLL) category (μg/dL)				Association with BLL[a] (95% CI) [*P* value]	
		≤ 5 μg/dL N=33 (6%)	6-10 μg/dL N=265 (48%)	11-15 μg/dL N=173 (31%)	> 15 μg/dL N=82 (15%)	Undadjusted	Adjusted for male sex
Self-reported offending variety, mean (SD)							
Age 15 years	2.13 (3.37)	1.39 (2.34)	1.95 (3.37)	2.29 (3.33)	2.71 (3.75)	.10* (0.02, 0.18) [.019]	0.09* (0.01, 0.17) [.028]
Age 18 years	4.76 (4.59)	3.69 (4.23)	4.45 (4.18)	5.13 (4.72)	5.48 (5.59)	.09* (0.01, 0.17) [.036]	0.06 (-0.02, 0.14) [.134]
Age 21 years	4.68 (4.22)	4.00 (3.06)	4.52 (3.98)	4.84 (4.50)	5.19 (4.80)	.06 (-.02, .14) [.145]	0.03 (-0.04, 0.11) [.417]
Age 26 years	3.01 (3.25)	2.03 (1.49)	2.75 (3.14)	3.53 (3.59)	3.16 (3.25)	.08 (-.01, .16) [.068]	0.04 (-0.03, 0.12) [.250]
Age 32 years	2.32 (2.57)	1.50 (1.83)	2.03 (1.83)	3.02 (3.44)	2.10 (2.46)	.08 (-.01, .16) [.069]	0.05 (-0.03, 0.13) [.239]
Age 38 years	1.12 (1.74)	0.74 (0.73)	1.02 (1.59)	1.41 (2.16)	0.99 (1.44)	.04 (-.04, .12) [.359]	0.02 (-0.06, 0.09) [.702]

Notes: Full Sample N=553. Wave 15: n= 543, wave 18: n=535, wave 21: n=541, wave 26: n=543, wave 32: n=542, wave 38: n=540.
[a] Standardized β coefficients reported for offending variety regressed on BLL; these estimates can be interpreted as correlation coefficients (*r*).
* *P* < .05

eTable 2. Attrition Analysis Comparing Dunedin Study Members Meeting Study Inclusion Criteria on Primary Variables With and Without Blood Collected at Age 11 Years

Measure	Blood lead at age 11 years		*P* value[a]
	Not Collected N=414	Collected N=553	
Primary variables			
Criminal conviction			1.000
No conviction, N (%)	299 (72.2%)	399 (72.2%)	
Conviction, N (%)	115 (27.8%)	154 (27.8%)	
Conviction subgroup 1			.792
One-time offender, N (%)	46 (11.1%)	68 (12.3%)	
Recidivistic offender, N (%)	69 (16.7%)	86 (15.6%)	
Conviction subgroup 2			.729
Nonviolent offender, N (%)	70 (16.9%)	101 (18.3%)	
Violent offender, N (%)	45 (10.9%)	53 (9.6%)	
Self-reported offending variety, mean (SD)			
Age 15 years	2.18 (2.80)	1.99 (2.82)	.294
Age 18 years	4.20 (3.29)	4.24 (3.15)	.859
Age 21 years	4.21 (3.27)	4.22 (3.02)	.946
Age 26 years	2.86 (2.76)	2.83 (2.55)	.832
Age 32 years	2.16 (2.31)	2.25 (2.19)	.554
Age 38 years	1.20 (1.81)	1.10 (1.59)	.375
Sex			.072
Female, N (%)	216 (52.2%)	255 (46.1%)	
Male, N (%)	198 (47.8%)	298 (53.9%)	
Childhood socioeconomic status	3.69 (1.16)	3.80 (1.12)	.131
Secondary variables[b]			
WISC-R childhood full-scale IQ	98.72 (15.37)	101.10 (14.25)	.016
Urban residence	320 (77.3%)	501 (90.6%)	<.001

Note: [a] Mean differences tested with Tukey's test. Proportion differences tested with Chi-square or Fisher's exact test.
[b] Secondary variables: WISC-R childhood full-scale IQ defined as standardized (M = 100, SD = 15) mean IQ score from assessments at ages 7 and 9 years. Urban residence is non-rural residence as determined from childhood address at age 11 years.

eTable 3. Model Results and Fit Statistics for Models of Associations of Blood Lead Level With Offending Outcomes

Measure	Association with BLL[a]				Test of model fit improvement in adjusted model (*P* value)[c]
	Unadjusted		Adjusted for male sex		
	Model results (95% CI)[*P* value]	Model fit statistic[b]	Model results (95% CI)[*P* value]	Model fit statistic[b]	
Criminal conviction					
No conviction, N (%)	1 - *reference*		1 - *reference*		
Conviction, N (%)	1.29 (1.06, 1.56) [.013]*	-323.99	1.23 (1.00, 1.51) [.052]	-301.99	<.001
Conviction subgroup comparison 1					
One-time offender, N (%)	1.29 (0.99, 1.68) [.058]	-425.42	1.25 (0.95, 1.64) [.107]	-401.72	<.001
Recidivistic offender, N (%)	1.28 (1.01, 1.63) [.046]*		1.21 (0.93, 1.57) [.149]		
Conviction subgroup comparison 2					
Nonviolent offender, N (%)	1.33 (1.06, 1.67) [.013]*	-422.93	1.28 (1.01, 1.61) [.041]*	-400.42	<.001
Violent offender, N (%)	1.20 (0.89, 1.62) [.241]		1.13 (0.82, 1.55) [.449]		
Self-reported offending variety					
Age 15 years	0.10 (0.02, 0.19) [.016]*	0.011	0.10 (0.01, 0.18) [.023]*	0.014	.181
Age 18 years	0.09 (0.00, 0.17) [.043]*	0.008	0.06 (-0.02, 0.14) [.164]	0.106	<.001
Age 21 years	0.04 (-0.04, 0.13) [.296]	0.002	0.01 (-0.06, 0.09) [.748]	0.124	<.001
Age 26 years	0.09 (0.01, 0.17) [.032]*	0.009	0.06 (-0.02, 0.13) [.147]	0.143	<.001
Age 32 years	0.08 (-0.01, 0.16) [.076]	0.006	0.04 (-0.04, 0.12) [.278]	0.108	<.001
Age 38 years	0.04 (-0.04, 0.12) [.320]	0.002	0.02 (-0.06, 0.10) [.659]	0.065	<.001

Notes: Full Sample N=553. Wave 15: n= 543, wave 18: n=535, wave 21: n=541, wave 26: n=543, wave 32: n=542, wave 38: n=540.

[a] For conviction, odds ratio from logistic regression of conviction on blood lead level (BLL) in 5 µg/dL units; reference category is no conviction. For conviction subgroups, odds ratios from multinomial logistic regression models of subgroup on BLL in 5 µg/dL units; reference category is no conviction. For self-reported offending variety, standardized β coefficients reported for offending variety regressed on BLL; these estimates can be interpreted as correlation coefficients (*r*).

[b] For criminal conviction, log-likelihood is reported. For self-reported offending variety, R^2 is reported.

[c] *P* values tested for improved of model fit in adjusted model compared to the unadjusted model. For criminal conviction, likelihood ratio tests were used. For offending variety, F-tests were used.

eTable 4. Association of Blood Lead Level With Offending Outcomes Using Transformations of the Lead Variable. Table presents the association between childhood blood-lead levels and offending outcomes using different transformations of the blood-lead measure, including logarithmic transformation and a correction for hematocrit levels. Effects are based on standardized (M = 0, SD = 1) BLLs to enable comparison across the models.

	Association with BLL[a] (95% CI)[*P* value]		Association with Log BLL[a] (95% CI)[*P* value]		Association with hematocrit corrected[a] BLL (95% CI)[*P* value]	
	Unadjusted	**Adjusted for male sex**	**Unadjusted**	**Adjusted for male sex**	**Unadjusted**	**Adjusted for male sex**
Criminal conviction						
No conviction	1 - *reference*	1 - *reference*				
Conviction	1.26 (1.05, 1.51) [.013]*	1.21 (1.00, 1.46) [.052]	1.28 (1.06, 1.55) [.012]*	1.21 (0.99, 1.48) [.060]	1.25 (1.04, 1.50) [.015]*	1.21 (0.99, 1.46) [.056]
Conviction subgroup comparison 1						
One-time offender	1.27 (0.99, 1.62) [.058]	1.23 (0.96, 1.58) [.107]	1.31 (1.01, 1.71) [.045]*	1.26 (0.96, 1.65) [.090]	1.25 (0.97, 1.59) [.080]	1.21 (0.94, 1.55) [.137]
Recidivistic offender	1.26 (1.00, 1.57) [.046]	1.19 (0.94, 1.51) [.149]	1.25 (0.99, 1.59) [.063]	1.17 (0.91, 1.50) [.217]	1.26 (1.01, 1.57) [.044]*	1.20 (0.95, 1.52) [.132]
Conviction subgroup comparison 2						
Nonviolent offender	1.30 (1.05, 1.60) [.013]*	1.25 (1.01, 1.56) [.040]*	1.31 (1.05, 1.64) [.019]*	1.24 (0.99, 1.57) [.063]	1.28 (1.04, 1.57) [.022]*	1.23 (0.99, 1.53) [.059]
Violent offender	1.18 (0.89, 1.56) [.241]	1.12 (0.84, 1.50) [.450]	1.23 (0.91, 1.64) [.176]	1.15 (0.85, 1.55) [.371]	1.21 (0.92, 1.59) [.184]	1.15 (0.86, 1.54) [.349]
Self-reported offending variety, mean (SD)						
Age 15 years	0.10 (0.02, 0.19) [.016]*	0.10 (0.01, 0.18) [.023]*	0.11 (0.02, 0.19) [.013]*	0.10 (0.02, 0.19) [.019]*	0.11 (0.03, 0.20) [.010]*	0.11 (0.02, 0.19) [.014]*
Age 18 years	0.09 (0.00, 0.17) [.043]*	0.06 (-0.02, 0.14) [.164]	0.10 (0.01, 0.18) [.025]*	0.06 (-0.02, 0.14) [.130]	0.10 (0.01, 0.18) [.022]*	.07 (-0.01, 0.15) [.087]
Age 21 years	0.05 (-0.04, 0.13) [.296]	0.01 (-0.06, 0.09) [.748]	0.05 (-0.03, 0.13) [.221]	0.02 (-0.06, 0.09) [.692]	0.05 (-0.04, 0.13) [.277]	.02 (-0.06, 0.09) [.675]
Age 26 years	0.09 (0.01, 0.18) [.032]*	0.06 (-0.02, 0.13) [.147]	.11 (0.03, 0.19) [.009]*	0.07 (-0.01, 0.15) [.070]	0.09 (0.01, 0.17) [.035]*	.06 (-0.02, 0.13) [.139]
Age 32 years	0.08 (-0.01, 0.16) [.076]	0.04 (-0.04, 0.12) [.278]	.10 (0.02, 0.18) [.017]*	0.07 (-0.01, 0.14) [.105]	0.08 (-0.01, 0.16) [.070]	0.05 (-0.03, 0.13) [.244]
Age 38 years	0.04 (-0.04, 0.13) [.320]	0.02 (-0.06, 0.10) [.659]	0.07 (-0.01, 0.15) [.095]	0.04 (-0.04, 0.12) [.299]	0.05 (-0.03, 0.13) [.258]	0.03 (-0.05, 0.10) [.534]

Notes: Full Sample N=553. Wave 15: n= 543, wave 18: n=535, wave 21: n=541, wave 26: n=543, wave 32: n=542, wave 38: n=540.

[a] For conviction, odds ratio from logistic regression of conviction on blood lead level (BLL) in standardized (M = 0, SD = 1) units; reference category is no conviction. For conviction subgroups, odds ratios from multinomial logistic regression models of subgroup on BLL in standardized (M = 0, SD = 1) units; reference category is no conviction. For self-reported offending variety, standardized β coefficients reported for offending variety regressed on BLL; these estimates can be interpreted as correlation coefficients (*r*).

* *P* < .05