

Sustainability of artisanal mining of cobalt in DR Congo.

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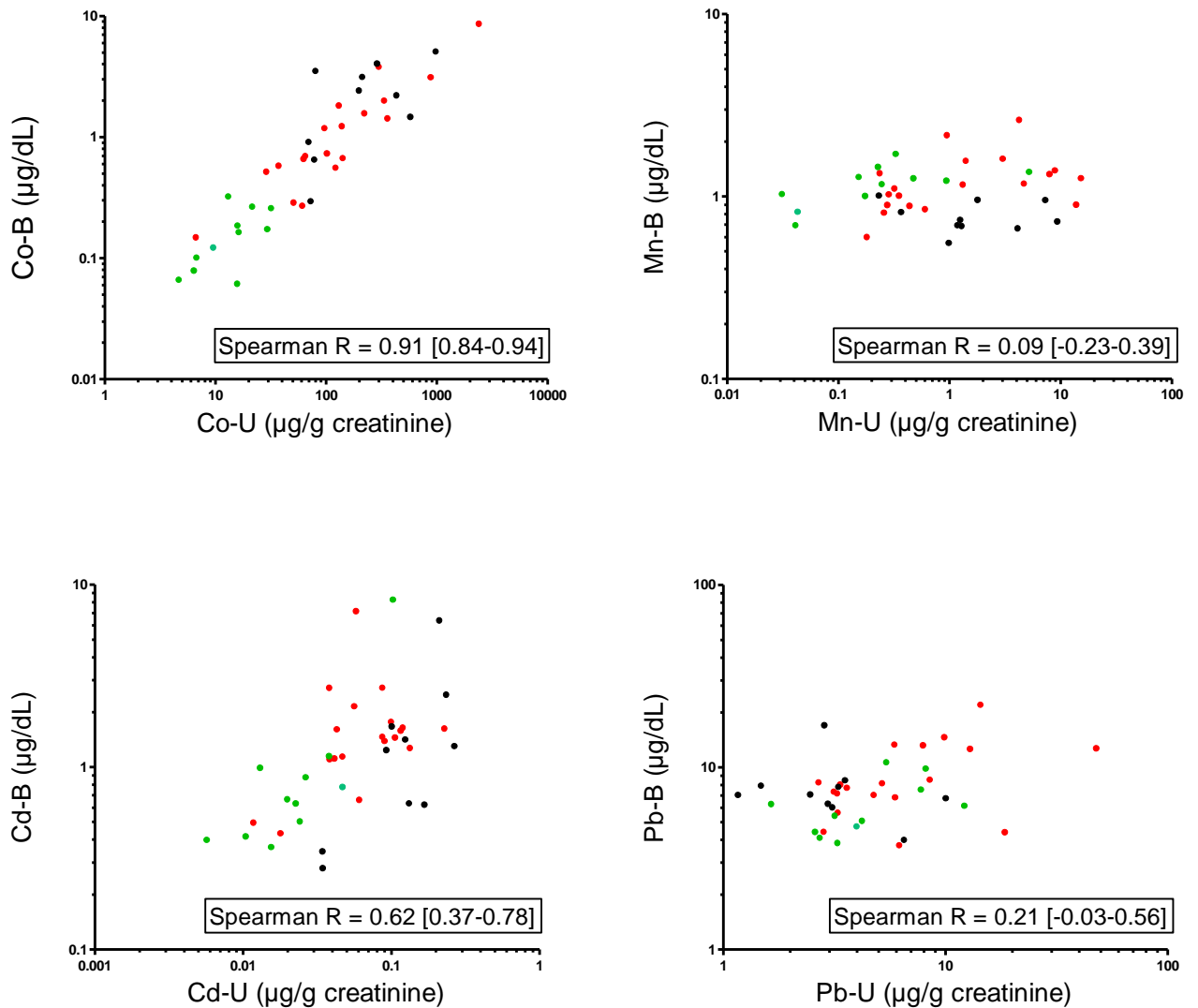
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Supplementary Figure 1. Photographs from the surveyed urban areas in Kolwezi



Photographs of a plot in the control area without mining (A) and of various plots in the mining area (B, C, D) showing the presence of numerous mine pits, covered by orange plastic sheeting, and mine tailings close to houses; a mineworker descending in a mine pit (E); mineworkers hoisting a bag of ore from a mine pit under plastic sheeting (F), and from a pit dug inside a house (G); mineworkers crushing blocks of ore containing black heterogenite (H); a woman collecting pieces of ore (I); a living room with bags of ore stored in the back of the room (J). Photographs D, H, I, and J were taken from the same plot. Letters do not correspond with codes of plots in Figure 1. (Photographs taken by B. Nemery, November 2014).

Supplementary Figure 2. Relation of concentrations of cobalt (Co), manganese (Mn), cadmium (Cd) and lead (Pb) in urine (-U) and in blood (-B)



Individual data from control residents (green symbols), exposed residents (red symbols) and diggers (black symbols). Note logarithmic scales for both x-axis and y-axis. Values of Spearman's rank correlation coefficient R are shown with 95% confidence intervals. The correlation between Pb-B and Pb-U is not significant ($p=0.07$), but the correlation is significant when Pb-U is expressed as µg/L instead of µg/g creatinine (Spearman $R = 0.50$ [0.23-0.70], $p<0.001$).

Supplementary Table 1: *Aqua regia* soluble concentrations of trace metals ($\mu\text{g/g}$ dry matter) in surface dust collected from control and exposed areas and in samples of ore.

	LOQ	CONTROL AREA (5 plots)			EXPOSED AREA (9 plots)			GM ratio (95% CI) EXPOSED/CONTROL	ORE (3 samples)			GM ratio (95% CI) ORE/CONTROL
		min	GM	max	min	GM	max		min	GM	max	
Al	20	3910	5130	7010	4130	6110	10410	1.2 (0.8-1.7)	6400	8300	10900	1.6 (1.0-2.6)
Ti	15	68	91	178	64	82	140	0.9 (0.5-1.6)	9	27	63	0.3 (0.1-0.6)
V	0.7	7	9	11	18	39	106	4.6 (2.6-8.1)	149	206	309	24.0 (11.4-50.4)
Cr	0.8	5	6	11	7	11	16	1.7 (1.2-2.5)	7	9	12	1.5 (0.9-2.4)
Mn	4	31	39	66	72	178	458	4.5 (2.0-10.2)	590	1390	3300	35.5 (12.3-102.6)
Fe	61	1200	2410	3690	3830	6960	12170	2.9 (1.7-5.9)	2250	4650	8390	1.9 (1.0-3.9)
Co	1	6	16	41	205	1100	8140	69.5 (18.4-263)	19900	26300	41700	1700 (290-9500)
Ni	1	<LOQ	2	4	2	10	72	4.5 (1.3-15.5)	127	223	636	106 (21.3-527)
Cu	4	27	91	555	50	193	606	2.1 (0.7-6.7)	1130	1470	2450	16.2 (3.6-72.3)
Zn	6	21	29	46	24	41	90	1.4 (0.8-2.3)	19	29	51	1.0 (0.5-1.9)
As	0.8	<LOQ	0.6	1.0	<LOQ	3	7	4.3 (2.2-8.6)	12	16	24	26.3 (10.7-65.0)
Se	3											
Y	0.2	0.4	0.7	1.1	1.6	4	8	5.7 (2.8-11.6)	6	15	25	23.0 (9.0-58.3)
Zr	0.3	<LOQ	0.9	4.3	0.4	1.1	3.3	1.3 (0.4-3.6)	<LOQ	0.4	0.9	0.5 (0.1-1.9)
Mo	0.6	<LOQ	0.3	0.3	<LOQ	0.9	4.4	2.8 (0.9-8.4)	2	8	45	24.2 (5.7-102)
Cd	0.5											
Sn	3											
Sb	0.1	<LOQ	0.1	0.3	<LOQ	0.2	0.7	2.4 (1.1-5.1)	0.4	0.4	0.4	4.3 (1.6-11.5)
La	0.03	1	2	3	5	9	19	3.7 (1.9-7.2)	9	22	57	9.6 (4.1-22.6)
Ce	0.03	3	5	7	8	21	66	4.2 (1.9-9.0)	73	96	163	19.1 (6.9-52.6)
Nd	0.06	1	2	3	4	8	26	4.7 (2.4-9.2)	15	23	36	12.9 (5.4-31.1)
Pb	0.4	3	5	7	4	9	20	1.9 (1.0-3.6)	20	33	54	7.0 (3.0-16.0)
U	0.05	0.05	0.15	0.25	0.4	2	15	13.3 (4.1-43.3)	28	44	83	301 (64.5-1408)

Concentrations are expressed as $\mu\text{g/g}$ dry matter (rounded to three significant digits). In each plot, a sample of surface dust was collected outdoor and indoor. As the metal concentrations were similar in indoor and outdoor dust, the average metal concentration was calculated for each plot. The data shown are the minimum value (min), geometric mean (GM) and maximum value (max) of these average metal concentrations in surface dust, and in 3 samples of ore. LOQ is Limit of Quantification (average values of two different runs of measurements). For the calculation of GM, a value of $\frac{1}{2}$ LOQ was attributed for concentrations < LOQ (for Se, Cd, and Sn all values were <LOQ). GM ratios are given with their 95% confidence interval (CI) and shown in bold when significantly different from 1.

Supplementary Table 2: Concentrations of trace metals ($\mu\text{g/L}$) in drinking water collected from control and exposed areas.

	Drinking water standard †	LOQ	CONTROL AREA (5 samples)*			EXPOSED AREA (7 samples)**			GM ratio (95% CI) EXPOSED/CONTROL
			min	GM	max	min	GM	max	
Al	900	0.75	1.1	6.0	53	1.3	11	50	1.8 (0.3-13.0)
Ti		0.00	<LOQ	0.15	0.30	<LOQ	0.02	0.11	0.1 (0.0-2.4)
V		0.01	0.30	0.45	0.81	0.07	0.18	0.70	0.4 (0.2-1.0)
Cr	50	0.03	<LOQ	0.09	0.79	<LOQ	0.06	0.90	0.7 (0.1-5.6)
Mn	50	0.16	1.3	7.9	80	4.7	19	71	2.4 (0.5-12.7)
Fe	300	0.81	<LOQ	2.5	47	<LOQ	4.9	21	1.9 (0.2-19.9)
Co		0.01	1.5	5.6	45	3.1	9.9	100	1.8 (0.4-7.1)
Ni	70	0.08	0.19	0.84	3.0	0.25	0.98	4.2	1.2 (0.3-4.8)
Cu	2000	0.26	0.67	3.7	33	1.7	8.5	62	2.3 (0.5-10.9)
Zn	5000	0.41	1.0	8.0	29	5.1	40	1486	5.0 (0.7-34.4)
As	10	0.05	<LOQ	0.08	0.31	<LOQ	0.07	0.25	0.8 (0.3-2.4)
Se	40	0.13	<LOQ	0.15	0.37	<LOQ	0.09	0.44	0.6 (0.2-1.9)
Y		0.004	<LOQ	0.01	0.03	0.03	0.38	7.0	45.4 (1.0-2063)
Zr		0.02	0.02	0.04	0.06	<LOQ	0.02	0.03	0.5 (0.1-2.7)
Mo		0.03	<LOQ	0.04	0.42	<LOQ	0.07	0.28	1.6 (0.2-12.3)
Cd	3	0.01	0.01	0.03	0.15	0.01	0.04	0.41	1.3 (0.4-5.0)
Sn		0.12	<LOQ	0.10	0.13	<LOQ	0.11	0.28	1.0 (0.2-5.1)
Sb	20	0.005	1.4	2.1	4.1	1.2	1.5	1.9	0.7 (0.4-1.5)
La		0.002	0.002	0.007	0.07	0.008	0.17	11	22.8 (0.2-3279)
Ce		0.001	0.002	0.01	0.20	0.005	0.15	12	14.1 (0.1-3433)
Nd		0.003	<LOQ	0.008	0.09	0.02	0.20	6	24.8 (0.4-1681)
Pb	10	0.03	<LOQ	0.02	0.08	<LOQ	0.07	1.0	2.9 (0.3-26.9)
U	30	0.003	0.004	0.02	0.43	<LOQ	0.02	0.12	0.7 (0.1-4.5)

† Standards for drinking water as available from the World Health Organization. *Guidelines for drinking-water quality. Fourth edition.* (2011). Available at www.who.int/water_sanitation_health/publications/2011/9789241548151_toc.pdf

Concentrations are expressed as $\mu\text{g/L}$ water. From each household (except two households in the exposed area) a sample of drinking water was obtained. The data shown are the minimum value (min), geometric mean (GM) and maximum value (max). LOQ is Limit of Quantification (average values of two different runs of measurements). For the calculation of GM, a value of $\frac{1}{2}$ LOQ was attributed for concentrations < LOQ. GM ratios are given with their 95% confidence interval (CI) and shown in bold when significantly different from 1.

Supplementary Table 3: Concentrations ($\mu\text{g/g}$ creatinine) of trace metals in urine from 88 residents according to exposure

	Reference values †		CONTROL AREA (23 subjects)	EXPOSED AREA (65 subjects)	GM ratio (95% CI) EXPOSED/CONTROL		
	median	upper limit	GM (95% CI)	GM (95% CI)	crude	adjusted for age & sex	adjusted for age, sex & plot
Creatinine (g/L)			0.91 (0.70-1.19)	1.04 (0.91-1.20)	1.12 (0.83-1.51)	1.11 (0.81-1.51)	1.09 (0.72-1.67)
Li	21.5	100	17.6 (13.7-22.6)	28.6 (25.1-32.5)	1.62*** (1.25-2.10)	1.55*** (1.20-2.02)	1.65** (1.15-2.34)
Al	2.04	10	23.4 (16.4-33.3)	25.3 (20.6-31.0)	1.08 (0.72-1.61)	1.21 (0.82-1.78)	1.35 (0.85-2.14)
V	0.22	2.0	0.61 (0.49-0.76)	0.78 (0.65-0.92)	1.26 (0.93-1.73)	1.31 (0.96-1.79)	1.49 (0.90-2.46)
Cr	0.11	0.35	0.32 (0.25-0.39)	0.38 (0.31-0.47)	1.21 (0.84-1.74)	1.26 (0.88-1.81)	1.31 (0.90-1.92)
Mn	<0.043	1	0.47 (0.25-0.87) #	0.90 (0.64-1.25)	1.91 (0.98-3.71)	2.36** (1.25-4.46)	2.51** (1.27-4.90)
Co	0.20	1.3	15.0 (10.6-21.2)	101 (75.3-135)	6.73*** (3.95-11.4)	7.05*** (4.29-11.6)	6.69*** (3.25-13.9)
Ni	1.79	5	4.01 (3.16-5.08)	5.11 (4.13-6.31)	1.27 (0.87-1.86)	1.29 (0.88-1.88)	1.46 (0.87-2.48)
Cu	6.99	14	16.4 (13.4-20.0)	18.8 (16.1-21.8)	1.15 (0.87-1.52)	1.12 (0.84-1.49)	1.25 (0.85-1.82)
Zn	246	770	352 (273-455)	411 (350-482)	1.16 (0.86-1.58)	1.14 (0.84-1.54)	1.17 (0.85-1.62)
As	13.7	260	46.6 (37.4-58.0)	42.0 (34.8-50.6)	0.90 (0.64-1.26)	0.93 (0.67-1.29)	1.09 (0.65-1.84)
Se	21.6	40	34.2 (28.4-41.3)	36.4 (32.2-41.1)	1.06 (0.86-1.34)	1.09 (0.87-1.37)	1.25 (0.87-1.79)
Mo	29.8	100	99.3 (74.4-133)	116 (96.7-139)	1.17 (0.83-1.65)	1.15 (0.82-1.62)	1.32 (0.78-2.25)
Cd	0.22	0.7	0.65 (0.47-0.89)	0.77 (0.62-0.95)	1.19 (0.80-1.77)	1.16 (0.80-1.69)	1.40 (0.80-2.44)
Sn	0.35	2.5	0.45 (0.28-0.72)	0.41 (0.32-0.52)	0.90 (0.55-1.48)	0.93 (0.60-1.44)	1.09 (0.58-2.05)
Sb	0.04	0.25	0.07 (0.05-0.10) #	0.11 (0.09-0.14) #	1.51* (1.03-2.24)	1.58* (1.09-2.30)	1.73* (1.05-2.86)
Te	0.14	0.5	0.58 (0.43-0.78)	0.43 (0.36-0.51)	0.74 (0.54-1.03)	0.76 (0.55-1.06)	0.90 (0.52-1.58)
Ba	1.86	8	1.77 (1.10-2.86)	2.02 (1.55-2.63)	1.15 (0.68-1.94)	1.21 (0.71-2.07)	1.28 (0.66-2.48)
Tl	0.18	0.5	0.31 (0.26-0.39)	0.25 (0.22-0.30)	0.81 (0.61-1.07)	0.84 (0.63-1.11)	0.93 (0.61-1.40)
Pb	1.78	3	3.88 (3.04-4.94)	4.71 (3.85-5.76)	1.21 (0.84-1.75)	1.18 (0.83-1.69)	1.31 (0.85-2.01)
U	<0.007	0.04	0.03 (0.02-0.04)	0.05 (0.04-0.06)	1.54 (0.93-2.55)	1.66* (1.00-2.77)	2.01(0.81-5.00)

† Reference values according to Hoet et al. *Clin. Chem. Lab. Med.* **51**, 839–849 (2013)

Subjects with creatinine concentration <0.3 g/L (2 controls, 4 exposed) or >3g/L (2 exposed) have been excluded

2 or 3 subjects with values below LOD were given a value of ½ LOD.

Trace metal concentrations are expressed as $\mu\text{g/g}$ creatinine and presented as geometric means (GM) with 95% confidence intervals (CI). GM ratios are presented with 95% CI and shown in bold when significantly different from 1; * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Supplementary Table 4: Concentrations (µg/g creatinine) of trace metals in urine from 88 residents according to exposure and stratified by age, and 23 artisanal mineworkers (diggers)

	CONTROL AREA ADULTS N=11 CHILDREN N=12 GM (95% CI)	EXPOSED AREA ADULTS N=38 CHILDREN N=27 GM (95% CI)	GM ratio (95% CI) EXPOSED/CONTROL			DIGGERS N=23 GM (95% CI)	GM ratio (95% CI) #	
			crude	adjusted for age & sex	adjusted for age, sex & plot		crude	adjusted for age & sex
Creatinine (g/L)	0.81 (0.51-1.29) <i>1.02 (0.71-1.46)</i>	1.12 (0.93-1.35) <i>0.95 (0.76-1.17)</i>	1.30 (0.81-2.10) <i>0.93 (0.64-0.74)</i>	1.30 (0.81-2.09) <i>1.05 (0.75-1.47)</i>	1.18 (0.96-2.16) <i>1.05 (0.77-1.43)</i>	1.44 (1.12-1.86)	1.89 (1.11-5.21) 1.30 (0.80-2.13)	1.66 (0.88-3.14) 1.30 (0.80-2.14)
Li	25.2 (17.7-35.7) <i>12.7 (9.70-16.7)</i>	23.4 (19.8-27.6) <i>37.9 (32.2-44.6)</i>	0.93 (0.65-1.32) 2.98*** (1.23-4.00)	0.93 (0.66-1.32) 2.44*** (1.90-3.15)	0.93 (0.67-1.28) 2.46*** (1.88-3.22)	19.8 (15.4-25.3)	0.78 (0.53-1.16) 0.85 (0.64-1.12)	0.73 (0.46-1.17) 0.79 (0.54-1.15)
Al	21.1 (11.3-39.5) <i>23.6 (16.2-40.6)</i>	20.1 (15.7-25.9) <i>34.9 (25.4-47.9)</i>	0.95 (0.55-1.66) <i>1.36 (0.79-2.35)</i>	0.95 (0.56-1.62) 1.65** (1.11-2.44)	1.06 (0.53-2.16) 1.65** (1.15-2.36)	19.5 (14.5-26.3)	0.93 (0.53-1.63) 0.97 (0.65-1.46)	1.35 (0.70-2.61) 1.42 (0.83-2.45)
V	0.64 (0.44-0.93) <i>0.59 (0.44-0.79)</i>	0.61 (0.49-0.76) <i>1.09 (0.85-1.38)</i>	0.96 (0.62-1.48) 1.84** (1.24-2.73)	0.95 (0.62-1.47) 1.69** (1.16-2.45)	1.02 (0.58-1.82) <i>1.36 (0.79-2.39)</i>	1.26 (0.93-1.70)	1.97** (1.22-3.17) 2.06*** (1.46-2.90)	2.40** (1.35-4.26) 2.51*** (1.57-4.03)
Cr	0.28 (0.19-0.42) <i>0.35 (0.24-0.76)</i>	0.29 (0.22-0.38) <i>0.55 (0.44-0.72)</i>	1.04 (0.60-1.79) 1.59* (1.06-2.39)	1.03 (0.60-1.79) <i>1.38 (0.93-2.04)</i>	1.03 (0.62-1.72) 1.82* (1.14-2.92)	0.27 (0.21-0.35)	0.98 (0.58-1.67) 0.95 (0.65-1.39)	1.03 (0.678-2.43) 1.24 (0.73-2.10)
Mn	0.29 (0.10-0.83) <i>0.74 (0.35-1.58)</i>	0.69 (0.47-1.02) <i>1.29 (0.78-2.37)</i>	2.41* (1.01-5.75) <i>1.75 (0.63-4.82)</i>	2.40* (1.06-5.44) 2.73* (1.19-6.29)	2.23 (0.84-5.81) 3.10* (1.28-7.46)	1.21 (0.72-2.05)	4.23** (1.70-10.5) 1.75 (0.91-3.38)	8.33*** (2.89-24.0) 3.48** (1.45-8.31)
Co	12.3 (6.45-23.6) <i>17.9 (12.3-26.2)</i>	63.8 (44.3-91.9) <i>193 (131-294)</i>	5.17*** (2.46-10.9) 10.7*** (5.76-20.0)	5.16*** (2.44-10.9) 9.33*** (4.73-18.4)	4.71*** (2.01-11.0) 7.46*** (2.86-19.7)	133 (83.6-211)	10.7*** (4.90-23.7) 2.08* (1.18-3.68)	10.9*** (4.21-28.1) 2.11* (0.96-4.60)
Ni	4.32 (2.92-6.41) <i>3.74 (2.08-3.21)</i>	4.15 (3.14-5.49) <i>6.94 (5.00-9.38)</i>	0.96 (0.55-1.66) 1.83* (1.10-3.04)	0.96 (0.55-1.67) <i>1.52 (0.87-2.67)</i>	1.08 (0.57-2.05) <i>1.48 (0.76-2.86)</i>	4.31 (3.07-6.03)	1.00 (0.56-1.78) 1.04 (0.61-1.79)	1.07 (0.53-2.15) 1.11 (0.62-1.98)
Cu	15.5 (10.7-22.4) <i>24.3 (13.4-22.2)</i>	15.5 (12.7-19.1) <i>24.3 (20.2-29.7)</i>	1.01 (0.66-1.53) 1.42* (1.02-1.97)	1.01 (0.67-1.52) <i>1.35 (0.92-1.99)</i>	1.11 (0.70-1.73) <i>1.25 (0.89-1.75)</i>	15.4 (12.3-19.4)	1.00 (0.65-1.53) 0.99 (0.73-1.35)	0.99 (0.59-1.64) 0.99 (0.65-1.49)
Zn	356 (214-593) <i>348 (267-457)</i>	340 (273-423) <i>535 (437-657)</i>	0.95 (0.59-1.53) 1.53* (1.09-2.16)	0.96 (0.59-1.55) <i>1.15 (0.88-1.51)</i>	0.96 (0.61-1.51) <i>1.35 (0.95-1.92)</i>	373 (277-504)	1.05 (0.60-1.53) 1.10 (0.76-1.58)	0.94 (0.51-1.74) 0.98 (0.59-1.63)
As	39.7 (26.8-58.9) <i>53.9 (42.0-69.2)</i>	34.2 (26.7-43.7) <i>58.0 (42.6-73.6)</i>	0.86 (0.52-1.41) <i>1.04 (0.67-1.60)</i>	0.86 (0.52-1.42) <i>0.89 (0.58-1.35)</i>	0.95 (0.51-1.79) <i>0.96 (0.58-1.60)</i>	42.7(28.78-63.3)	1.08 (0.61-1.91) 1.25 (0.83-1.89)	1.07 (0.53-2.14) 1.24 (0.70-2.20)
Se	33.9 (22.8-50.3) <i>34.5 (22.5-40.3)</i>	30.2 (26.1-35.0) <i>47.3 (39.7-56.4)</i>	0.89 (0.64-1.24) 1.37* (1.04-1.81)	0.89 (0.64-1.23) <i>1.23 (0.93-1.62)</i>	1.01 (0.67-1.52) <i>1.42 (1.00-2.01)</i>	29.7 (24.0-36.8)	0.88 (0.62-1.25) 0.98 (0.76-1.27)	1.06 (0.70-1.62) 1.19 (0.84-1.69)
Mo	88.8 (60.5-130) <i>110 (88.2-178)</i>	95.2 (75.9-120) <i>153 (110-208)</i>	1.07 (0.68-1.70) <i>1.39 (0.84-2.31)</i>	1.07 (0.67-1.72) <i>1.13 (0.65-1.96)</i>	1.26 (0.73-2.20) <i>1.17 (0.61-2.27)</i>	72.9 (53.1-100)	0.82 (0.67-1.72) 0.77 (0.53-1.10)	0.75 (0.41-1.39) 0.70 (0.42-1.16)
Cd	0.84 (0.48-1.49) <i>0.59 (0.36-0.71)</i>	0.88 (0.64-1.21) <i>0.64 (0.40-0.82)</i>	1.04 (0.54-1.99) <i>1.26 (0.82-1.93)</i>	1.03 (0.58-1.84) <i>0.99 (0.63-1.54)</i>	1.22 (0.64-2.36) <i>1.15 (0.69-1.92)</i>	0.58 (0.38- 89)	0.69 (0.34-1.39) 0.66 (0.40-1.10)	1.19 (0.55-2.57) 1.15 (0.61-2.16)
Sn	0.22 (0.15-0.30) <i>0.89 (0.47-1.89)</i>	0.26 (0.21-0.32) <i>0.79 (0.52-1.18)</i>	1.19 (0.77-1.85) <i>0.88 (0.43-1.80)</i>	1.19 (0.76-1.85) <i>0.53 (0.27-1.06)</i>	1.21 (0.77-1.90) <i>0.68 (0.31-1.49)</i>	0.26 (0.16-0.41)	1.20 (0.67-2.14) 1.01 (0.66-1.53)	1.36 (0.67-2.76) 1.14 (0.64-2.05)
Sb	0.06 (0.04-0.10) <i>0.09 (0.05-0.15)</i>	0.09 (0.07-0.12) <i>0.15 (0.12-0.19)</i>	1.44 (0.81-2.58) 1.77* (1.10-2.86)	1.44 (0.82-2.51) <i>1.45 (0.85-2.47)</i>	1.43 (0.85-2.41) <i>1.60 (0.89-2.89)</i>	0.04 (0.03-0.06)	0.70 (0.39-1.26) 0.49*** (0.32-0.74)	0.88 (0.44-1.73) 0.61 (0.34-1.07)
Te	0.58 (0.32-1.08) <i>0.58 (0.44-0.75)</i>	0.35 (0.29-0.43) <i>0.57 (0.43-0.75)</i>	0.60* (0.38-0.97) <i>0.99 (0.64-1.52)</i>	0.60* (0.38-0.96) <i>0.78 (0.51-1.21)</i>	0.71 (0.36-1.38) <i>0.88 (0.54-1.43)</i>	0.27 (0.21-0.36)	0.47** (0.29-0.76) 0.77 (0.54-1.09)	0.62 (0.34-1.11) 1.03 (0.63-1.66)
Ba	2.90 (1.31-6.41) <i>1.12 (0.65-1.94)</i>	1.55 (1.11-2.17) <i>2.94 (1.95-4.41)</i>	0.53 (0.26-1.11) 2.65** (1.31-15.34)	0.53 (0.26-1.10) 2.41* (1.13-5.14)	0.61 (0.26-1.42) 2.41* (1.21-4.81)	0.85 (0.55-1.21)	0.29** (0.14-1.09) 0.55* (0.32-0.95)	0.44 (0.18-1.10) 0.83 (0.39-1.76)
Tl	0.29 (0.19-0.43) <i>0.34 (0.28-0.42)</i>	0.22 (0.18-0.27) <i>0.31 (0.24-0.39)</i>	0.77 (0.50-1.19) <i>0.90 (0.62-1.29)</i>	0.77 (0.51-1.16) <i>0.72 (0.50-1.04)</i>	0.81 (0.51-1.27) <i>0.72 (0.51-1.00)</i>	0.14 (0.10-0.18)	0.48** (0.30-0.77) 0.63** (0.45-0.88)	0.70 (0.41-1.21) 0.91 (0.58-1.42)
Pb	3.21 (2.14-4.80) <i>4.62 (3.41-6.27)</i>	3.53 (2.75-4.53) <i>7.37 (5.34-9.36)</i>	1.10 (0.51-2.58) <i>1.53 (0.97-2.41)</i>	1.10 (0.66-1.83) <i>1.04 (0.70-1.54)</i>	0.14 (-0.36-0.65) <i>1.04 (0.72-1.49)</i>	2.48 (1.93-3.18)	0.77 (0.47-1.28) 0.70 (0.49-1.01)	0.82 (0.45-1.50) 0.75 (0.45-1.22)
U	0.03 (0.02-0.06) <i>0.03 (0.02-0.04)</i>	0.04 (0.02-0.06) <i>0.07 (0.05-0.10)</i>	1.14 (0.51-2.58) 2.30** (1.33-3.95)	1.13 (0.52-2.47) 2.19* (1.21-3.98)	1.08 (0.36-3.25) <i>1.26** (0.45-2.07)</i>	0.09 (0.06-0.14)	2.90** (1.31-6.43) 2.54** (1.43-4.51)	5.79*** (2.30-14.6) 5.11*** (2.39-10.9)

Data for children are in italics. # GM ratio of DIGGERS/CONTROL ADULTS in first row, GM ratio of DIGGERS/EXPOSED ADULTS in second row.

Trace metal concentrations are expressed as µg/g creatinine and presented as geometric means (GM) with 95% confidence intervals (CI). GM ratios are presented with 95% CI and shown in bold if significantly different from 1; * p<0.05, ** p<0.01, *** p<0.001

Supplementary Table 5: Concentrations ($\mu\text{g/dL}$) of trace metals in blood from 33 residents according to exposure

	Reference value [†]		CONTROL AREA (13 subjects)	EXPOSED AREA (20 subjects)	GM ratio (95% CI) EXPOSED/CONTROL		
	Geometric mean	95 th percentile	GM (95% CI)	GM (95% CI)	crude	adjusted for age & sex	adjusted for age, sex & plot
Mn	0.77	1.29	1.15 (0.97-1.35)	1.12 (0.95-1.32)	0.98 (0.77-1.23)	1.04 (0.83-1.31)	1.04 (0.84-1.28)
Co	0.03	0.05	0.18 (0.11-0.29)	1.02 (0.65-1.61)	5.72*** (2.94-11.2)	6.76*** (3.31-13.8)	6.69*** (2.80-16.0)
Cd	0.04	0.17	0.03 (0.02-0.04)	0.06 (0.04-0.08)	2.15** (1.22-3.81)	1.67* (1.00-2.77)	1.67* (1.06-2.64)
Hg	0.14	0.52	0.29 (0.25-0.34)	0.20 (0.17-0.23)	0.69** (0.55-0.86)	0.66** (0.52-0.85)	0.63*** (0.47-0.86)
Pb	1.88	4.93	5.70 (4.64-7.02)	8.92 (7.15-11.1)	1.56** (1.15-2.13)	1.53* (1.10-2.13)	1.52** (1.14-2.05)

[†] According to Nisse et al. *Int. J. Hyg. Environ. Health* **220**, 341–363 (2017). (after rounding of their data in $\mu\text{g/L}$)

Trace metal concentrations are expressed as $\mu\text{g/dL}$ and presented as geometric means (GM) with 95% confidence intervals (CI). GM ratios are presented with 95% CI and shown in bold if significantly different from 1; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Supplementary Table S6: Concentrations ($\mu\text{g/dL}$) of trace metals in blood from 33 residents according to exposure and stratified by age, and 10 artisanal mineworkers (diggers)

	CONTROL AREA ADULTS N=7 CHILDREN N=6 GM (95% CI)	EXPOSED AREA ADULTS N=15 CHILDREN N=5 GM (95% CI)	GM ratio (95% CI) EXPOSED/CONTROL			DIGGERS N=10 GM (95% CI)	GM ratio (95% CI) #	
			crude	adjusted for age & sex	adjusted for age, sex & plot		crude	adjusted for age & sex
Mn	1.03 (0.78-1.35)	1.16 (0.93-1.44)	1.13 (0.79-1.60)	1.17 (0.88-1.56)	1.17 (0.92-1.49)	0.77 (0.67-0.88)	0.75 (0.54-1.04)	1.29 (0.89-1.86)
	<i>1.31 (1.08-1.59)</i>	<i>1.02 (0.91-1.15)</i>	<i>0.78* (0.63-0.95)</i>	<i>0.68** (0.53-0.87)</i>	<i>0.68*** (0.58-0.80)</i>		0.67** (0.51-0.87)	1.10 (0.80-1.52)
Co	0.18 (0.06-0.49)	0.88 (0.53-1.49)	5.05** (1.95-13.0)	5.66** (2.04-15.7)	4.81** (1.62-14.3)	1.78 (0.93-3.40)	10.16*** (3.83-26.9)	13.14*** (3.25-53.1)
	<i>0.18 (0.13-0.26)</i>	<i>1.57 (0.42-5.93)</i>	<i>8.64 *** (3.05-24.5)</i>	<i>7.45* (1.54-36.0)</i>	<i>6.55** (1.95-21.8)</i>		2.01 (0.90-4.52)	2.33 (0.67-8.04)
Cd	0.05 (0.03-0.08)	0.07 (0.05-0.10)	1.61 (0.93-2.79)	1.45 (0.82-2.56)	1.45 (0.90-2.34)	0.12 (0.07-0.19)	2.56** (1.36-4.81)	2.18 (0.90-5.35)
	<i>0.01 (0.00-0.03)</i>	<i>0.03 (0.00-0.07)</i>	<i>1.89 (0.74-4.82)</i>	<i>1.56 (0.37-6.55)</i>	<i>1.57 (0.61-4.01)</i>		1.59 (0.94-2.68)	1.49 (0.68-3.30)
Hg	0.31 (0.23-0.42)	0.21 (0.17-0.25)	0.68* (0.49-0.94)	0.68* (0.48-0.97)	0.66* (0.46-0.93)	0.39 (0.34-0.44)	1.25 (0.92-1.70)	1.09 (0.70-1.68)
	<i>0.27 (0.22-0.33)</i>	<i>0.17 (0.13-0.24)</i>	<i>0.64** (0.47-0.86)</i>	<i>0.63* (0.40-0.99)</i>	<i>0.58** (0.41-0.83)</i>		1.85*** (1.43-2.39)	1.60* (1.08-2.36)
Pb	4.93 (3.86-6.28)	8.92 (6.24-12.8)	1.72* (1.11-2.66)	1.63* (1.02-2.61)	1.63* (1.09-2.41)	7.34 (5.67-9.51)	1.49 (0.97-2.30)	1.39 (0.75-2.56)
	<i>6.77 (4.61-9.93)</i>	<i>3.48 (3.38-11.3)</i>	<i>1.54 (0.98-2.42)</i>	<i>1.12 (0.64-1.96)</i>	<i>1.13 (0.78-1.63)</i>		0.87 (0.61-10.63)	0.86 (0.50-1.48)

Data for children are in italics.

GM ratio of DIGGERS/CONTROL ADULTS in first row, GM ratio of DIGGERS/EXPOSED ADULTS in second row.

Trace metal concentrations are expressed as $\mu\text{g/dL}$ and presented as geometric means (GM) with 95% confidence intervals (CI). GM ratios are presented with 95% CI and shown in bold if significantly different from 1; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$