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New York State Biomonitoring Program for Trace Elements

Event #2, 2017

Trace Elements in Whole Blood, Urine, and Serum

September, 2017

Wadsworth Center
NEW YORK STATE DEPARTMENT OF HEALTH
Trace Elements Laboratory

NEW YORK STATE | Department of Health | Wadsworth Center

Event #2, 2017:
Trace Elements in Whole Blood, Urine, and Serum

9/14/2017

Dear Laboratory Director,

This report summarizes performance for the second biomonitoring proficiency test (PT) event of 2017 for **Trace Elements in Whole Blood, Urine, and Serum**. One of the key goals of this PT program is to achieve harmonization of biomonitoring data for trace elements.

Target Value Assignment and Performance Evaluation

For these PT materials, target values have been assigned for a limited number of trace elements that are gradable under criteria set by the NYS DOH Biomonitoring PT program. See assay-specific narratives for details. Data for additional trace elements are reported and are included here in order to characterize the PT materials more completely. Participant data and descriptive statistics are provided for educational purposes. No target value or acceptable range is implied.

Where the data permit, robust statistics were used to assign target values based on Algorithm A as defined by ISO 13528:2005E *"Statistical methods for use in proficiency testing by inter-laboratory comparisons"* [1]. Acceptable ranges for the "graded elements" are based on consensus criteria and/or those set by the NYS DOH's PT program. For example, some are fixed based on US regulatory guidelines (Pb, Cd) while for other elements the criteria are based on a consensus of the Network of PT scheme organizers for trace elements in occupational and environmental laboratory medicine [2]. Quality specifications are element and matrix specific; full details are provided under each element specific narrative.

A confidential, three-digit code number assigned by PT program staff identifies all laboratory participants.

Samples for the next PT event (Event #3 of 2017) will be shipped October 11, 2017. Comments about this report may be directed to trel@health.ny.gov.

Sincerely,

Patrick J. Parsons, PhD
Chief, Inorganic and Nuclear Chemistry
Division of Environmental Sciences
Wadsworth Center

Aubrey L. Galusha, PhD
Coordinator, Biomonitoring PT Program,
Division of Environmental Sciences
Wadsworth Center

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Event #2, 2017

Trace Elements in Whole Blood

Wadsworth Center
NEW YORK STATE DEPARTMENT OF HEALTH
Trace Elements Laboratory

Event #2, 2017:
Trace Elements in Whole Blood

PT Materials

Human whole blood was purchased from ZenBio, Inc. and preserved with K_2EDTA. The company certifies that this material was "non-reactive" for HBsAg, HBV DNA, HIV-1,2 Ab, HIV-1 RNA, HCV Ab, HCV RNA, and STS. Units of whole blood were filtered into polypropylene containers through cheesecloth to remove particulates and supplemented with arsenic (As), cadmium (Cd), cobalt (Co), chromium (Cr), mercury (Hg), manganese (Mn), lead (Pb), barium (Ba), beryllium (Be), copper (Cu), molybdenum (Mo), nickel (Ni), platinum (Pt), antimony (Sb), selenium (Se), tin (Sn), titanium (Ti), thallium (Tl), uranium (U), vanadium (V), tungsten (W), and zinc (Zn). Whole blood samples were placed on a rocker overnight prior to aliquoting 2-mL into polypropylene vials. PT samples were stored at -80°C until the week of the PT event, when they were thawed at 4°C prior to circulation to laboratories for analysis.

Graded Elements

Seven elements in whole blood are formally graded: As, Cd, Co, Cr, Hg, Mn and Pb. Target values for the graded elements are assigned to these pools based on (a) the robust mean calculated from data reported by all laboratories, or (b) where a robust mean is not possible, the arithmetic mean after outlier deletion.

Additional Elements

An additional 27 elements (beyond the seven graded) were reported by at least one participant: Ag, Al, Ba, Be, Bi, Ca, Cs, Cu, Fe, I, Li, Mg, Mo, Ni, Pt, Sb, Se, Sn, Sr, Te, Th, Ti, Tl, U, V, W, and Zn. These data are included here to provide a more complete characterization of the PT materials. All results reported by participant laboratories are tabulated and organized by lab code. The PT data are graphed for visual comparison purposes for all elements where at least five laboratories reported a value greater than the LOD. A statistical summary table is provided for samples where at least two comparable values were reported as above the LOD.

The summary statistics for the additional elements are provided for educational purposes only, i.e., no acceptable response is implied. However, it is expected that each laboratory would wish to investigate a potential source of bias if warranted by these data. Future events might result in additional elements becoming graded if a consensus can be reached regarding desired quality specifications.

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Results for Event #2, 2017: Summary Statistics

Whole Blood As (µg/L)					
	BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Target (Arithmetic Mean ($\bar{x}$))	50.8	7.8	11.2	4.1	18.8
Upper Limit	61.0	13.8	17.2	10.1	24.8
Lower Limit	40.6	1.8	5.2	0.0	12.8
Arithmetic SD (s)	5.0	0.7	1.7	0.4	1.8
Arithmetic RSD (%)	9.8	9.0	15.2	9.8	9.6
Number of Sample Measurements (N)	9	8	9	8	9

The acceptable range is based on quality specifications:
±6 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±6 µg/L at concentrations less than or equal to 30 µg/L. These quality specifications were established by New York State Department of Health's Wadsworth Center, the PT Program organizer.

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Results for Event #2, 2017:
Performance of Participating Laboratories

Whole Blood As (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
	Target	**50.8**	**7.8**	**11.2**	**4.1**	**18.8**
103	DRC/CC-ICP-MS	50.4	7.66	10.6	4.09	18.6
110	DRC/CC-ICP-MS	46.3	7.1	9.9	3.9	18.0
147	ICP-MS	52.8	7.64	10.9	3.99	20.0
200	ICP-MS	53.3	*11.3	15.0	*6.0	18.8
293	DRC/CC-ICP-MS	49.57	7.54	10.45	3.87	18.4
391	DRC/CC-ICP-MS	47.6	7.9	10.236	4.393	17.71
597	ICP-MS	42.53	7.05	9.45	3.69	15.76
598	DRC/CC-ICP-MS	58.5	9.42	12.8	4.93	21.8
599	DRC/CC-ICP-MS	56.5	7.85	11.6	4.20	20.5

Based on the grading criteria for As in Whole Blood, 100% of results were satisfactory, with 0 of the 9 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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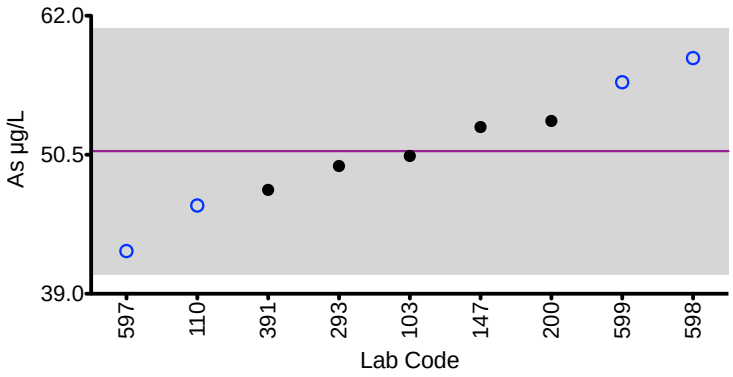
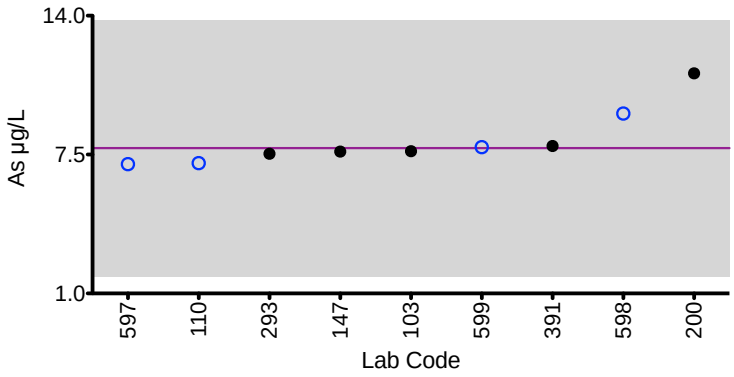
Results for Event #2, 2017: Summary Figures

Whole Blood As

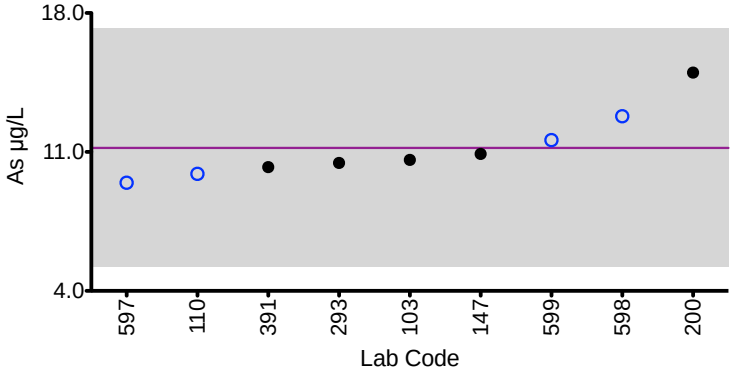
BE17-06



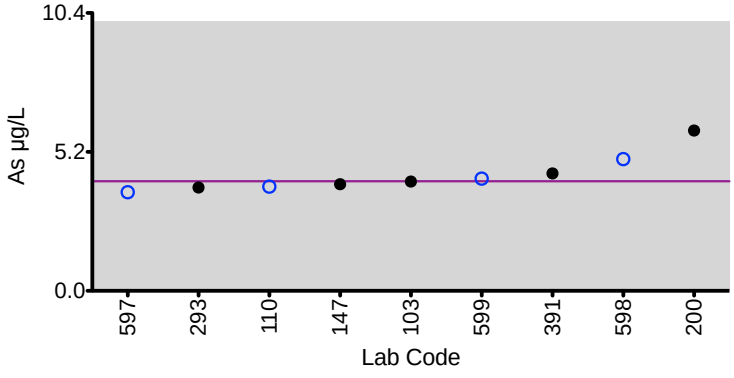
BE17-07



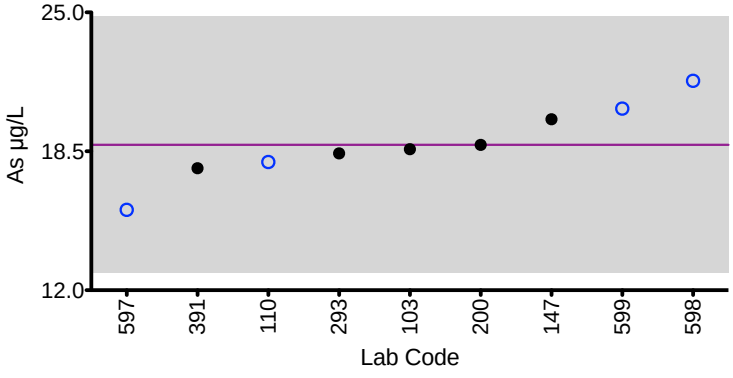
BE17-08



BE17-09



BE17-10



Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the arithmetic mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±6 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±6 µg/L at concentrations less than or equal to 30 µg/L.

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Results for Event #2, 2017: Summary Statistics

Whole Blood Cd (µg/L)					
	BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Target (Robust Mean (x*))	15.4	1.9	5.2	1.7	7.7
Upper Limit	17.7	2.9	6.2	2.7	8.9
Lower Limit	13.1	0.9	4.2	0.7	6.5
Robust SD (s*)	1.1	0.1	0.3	0.1	0.6
Robust RSD (%)	7.1	5.3	5.8	5.9	7.8
Number of Sample Measurements (N)	16	16	16	16	16
Standard Uncertainty (*u*)	0.357	0.030	0.104	0.021	0.180

The acceptable range is based on quality specifications:
±1 µg/L or ±15% around the target value, whichever is greater; thus, it is fixed at ±1 µg/L at concentrations less than or equal to 6.7 µg/L. These quality specifications are based on those used by US OSHA for occupational exposure.

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Results for Event #2, 2017:
Performance of Participating Laboratories

Whole Blood Cd (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
	Target	**15.4**	**1.9**	**5.2**	**1.7**	**7.7**
103	DRC/CC-ICP-MS	15.5	1.99	5.30	1.68	7.86
107	ICP-MS	16	2.0	5.3	1.7	7.9
110	ICP-MS	15.3	1.86	5.22	1.69	7.49
116	DRC/CC-ICP-MS	15.8	1.80	5.75	1.66	7.85
147	ICP-MS	13.6	1.83	4.99	1.67	7.42
200	ICP-MS	14.2	1.8	4.7	1.5	6.9
293	DRC/CC-ICP-MS	16.05	1.87	5.35	1.78	7.89
391	DRC/CC-ICP-MS	13.586	1.719	4.754	1.732	6.799
399	DRC/CC-ICP-MS	15.2	1.89	5.21	1.67	7.62
401	DRC/CC-ICP-MS	17.0	2.0	5.7	1.8	8.4
597	ICP-MS	14.40	1.82	4.87	1.63	7.12
598	ICP-MS	14.5	1.93	4.98	1.64	6.71
599	DRC/CC-ICP-MS	17.3	1.96	5.72	1.81	8.53
605	ICP-MS	15.4	1.90	5.22	1.76	8.24
606	ICP-MS	15.5	1.89	5.07	1.63	8.22
686	ICP-MS	16.3	1.92	5.39	1.71	8.09

Based on the grading criteria for Cd in Whole Blood, 100% of results were satisfactory, with 0 of the 16 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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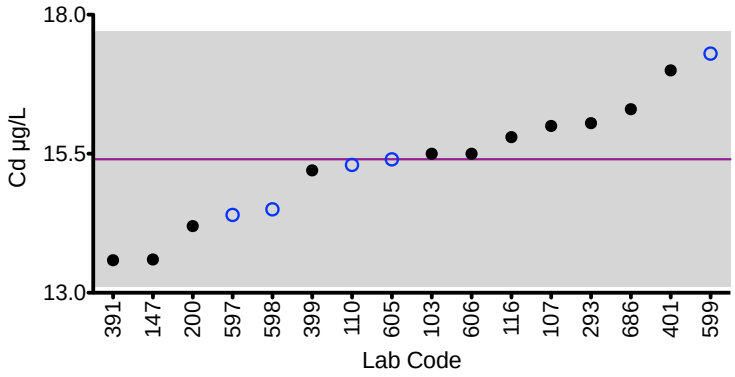
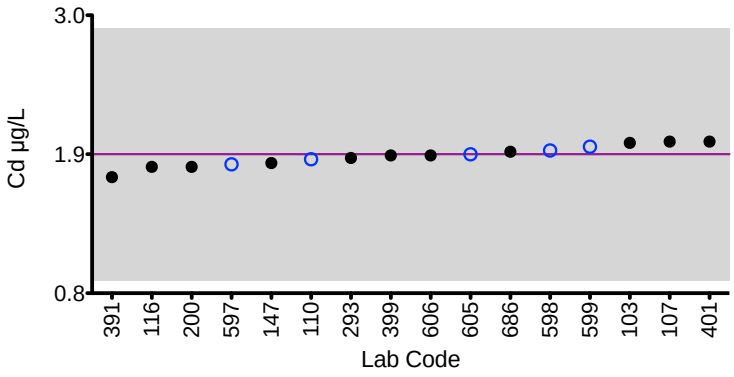
Results for Event #2, 2017: Summary Figures

Whole Blood Cd

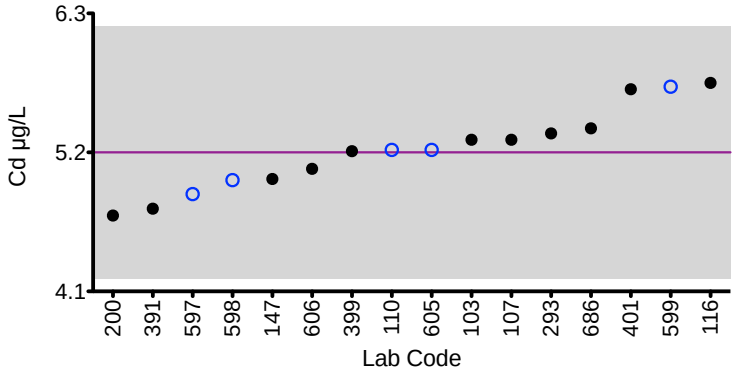
BE17-06



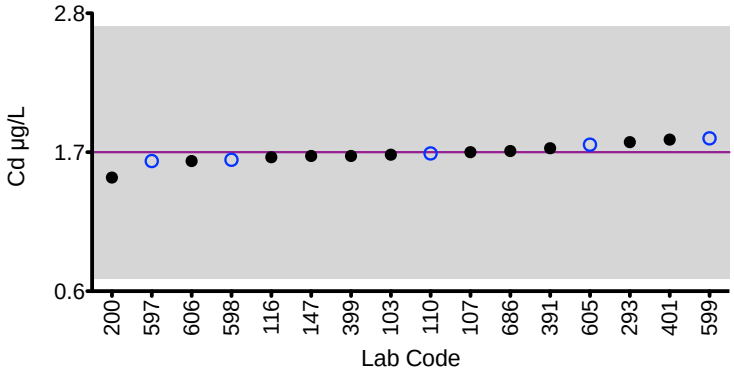
BE17-07



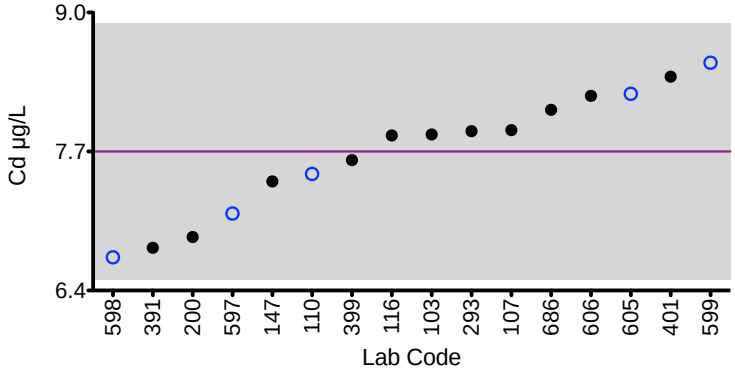
BE17-08



BE17-09



BE17-10



Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the robust mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±1 µg/L or ±15% around the target value, whichever is greater; thus, it is fixed at ±1 µg/L at concentrations less than or equal to 6.7 µg/L.

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Results for Event #2, 2017: Summary Statistics

Whole Blood Co (µg/L)					
	BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Target (Arithmetic Mean ($\bar{x}$))	8.5	2.5	12.5	0.97	5.0
Upper Limit	10.2	4.0	15.0	2.47	6.5
Lower Limit	6.8	1.0	10.0	0.00	3.5
Arithmetic SD (s)	1.0	0.3	0.6	0.04	0.3
Arithmetic RSD (%)	11.8	12.0	4.8	4.0	6.0
Number of Sample Measurements (N)	9	9	8	9	8

The acceptable range is based on quality specifications:
±1.5 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±1.5 µg/L at concentrations less than or equal to 7.5 µg/L. These quality specifications were established based on discussions with the US FDA, and represent a consensus from a network of Trace Element PT program organizers

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Results for Event #2, 2017:
Performance of Participating Laboratories

Whole Blood Co (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
	Target	**8.5**	**2.5**	**12.5**	**01**	**5**
103	DRC/CC-ICP-MS	8.53	2.30	13.2	0.966	5.27
110	ICP-MS	7.75	2.31	12.3	1.00	5.00
147	ICP-MS	7.54	2.30	12.5	0.943	5.06
293	DRC/CC-ICP-MS	8.41	2.29	12.84	0.95	5.08
391	DRC/CC-ICP-MS	7.981	3.187	11.917	0.957	4.484
401	DRC/CC-ICP-MS	8.4	2.3	13.2	1.0	5.3
597	ICP-MS	7.50	2.16	11.67	0.89	4.72
598	ICP-MS	10.5 ↑	2.84	12.4	1.05	5.00
599	DRC/CC-ICP-MS	9.57	2.60	*15.5 ↑	1.00	*6.20

Based on the grading criteria for Co in Whole Blood, 96% of results were satisfactory, with 0 of the 9 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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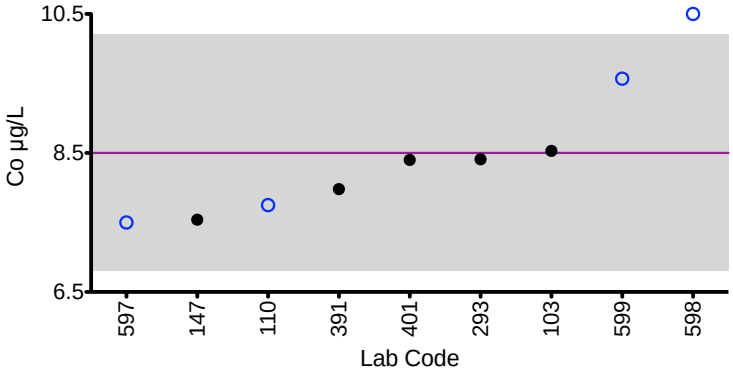
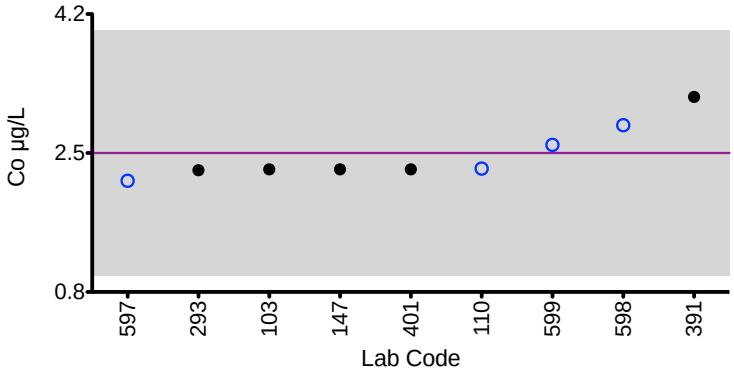
Results for Event #2, 2017: Summary Figures

Whole Blood Co

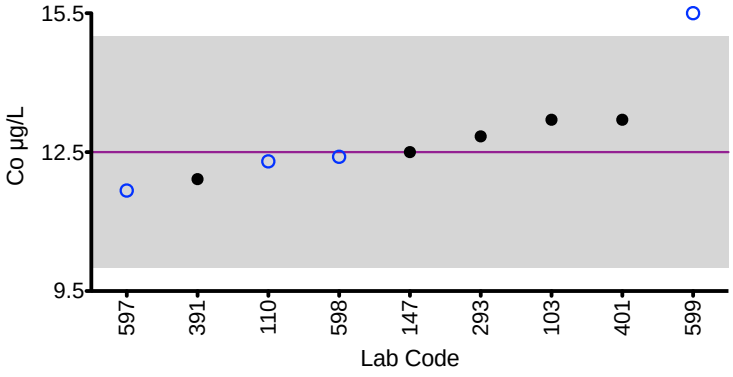
BE17-06



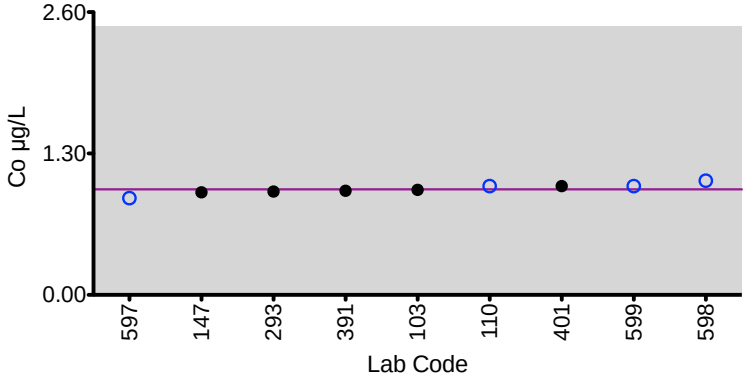
BE17-07



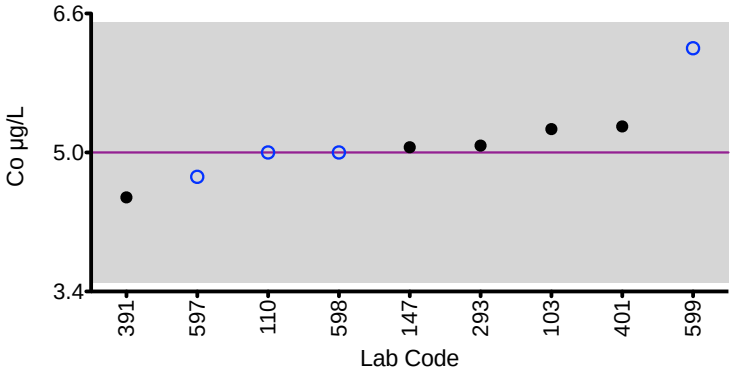
BE17-08



BE17-09



BE17-10



Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the arithmetic mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±1.5 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±1.5 µg/L at concentrations less than or equal to 7.5 µg/L.

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Results for Event #2, 2017:
Summary Statistics

Whole Blood Cr (µg/L)					
	BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Target (Arithmetic Mean ($\bar{x}$))	14.4	5.6	1.6	3.2	7.1
Upper Limit	17.3	7.6	3.6	5.2	9.1
Lower Limit	11.5	3.6	0.0	1.2	5.1
Arithmetic SD (s)	1.0	0.7	0.5	0.2	0.8
Arithmetic RSD (%)	6.9	12.5	31.3	6.3	11.3
Number of Sample Measurements (N)	7	7	6	6	7

The acceptable range is based on quality specifications:
±2 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±2 µg/L at concentrations less than or equal to 10 µg/L. These quality specifications were established based on discussions with the US FDA, and represent a consensus from a network of Trace Element PT program organizers

Results for Event #2, 2017:
Performance of Participating Laboratories

Whole Blood Cr (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
	Target	**14.4**	**5.6**	**1.6**	**3.2**	**7.1**
103	DRC/CC-ICP-MS	14.7	5.50	<1.25	3.13	7.07
110	DRC/CC-ICP-MS	13.4	4.9	1.4	3.0	6.7
147	DRC/CC-ICP-MS	14.1	5.88	1.07	3.36	7.59
293	DRC/CC-ICP-MS	15.2	5.54	1.3	3.43	7.4
391	DRC/CC-ICP-MS	12.846	4.963	2.1	3.154	6.1
401	DRC/CC-ICP-MS	15.6	7.1	2.2	*5.1	8.6
598	DRC/CC-ICP-MS	15.2	5.38	1.25	3.22	6.42

Based on the grading criteria for Cr in Whole Blood, 100% of results were satisfactory, with 0 of the 7 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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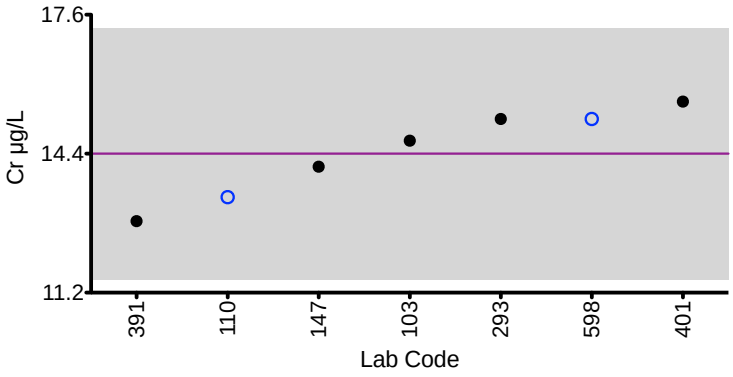
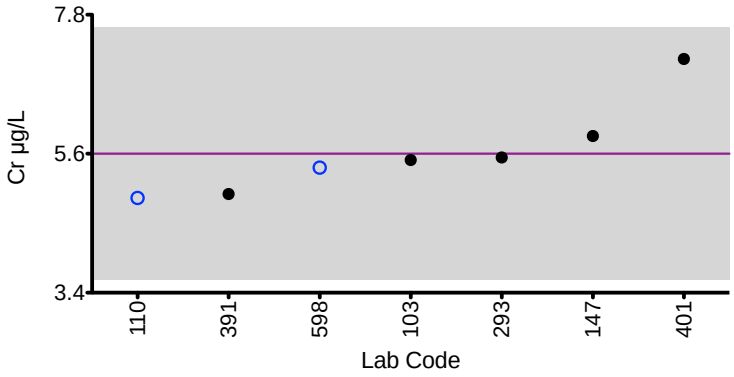
Results for Event #2, 2017: Summary Figures

Whole Blood Cr

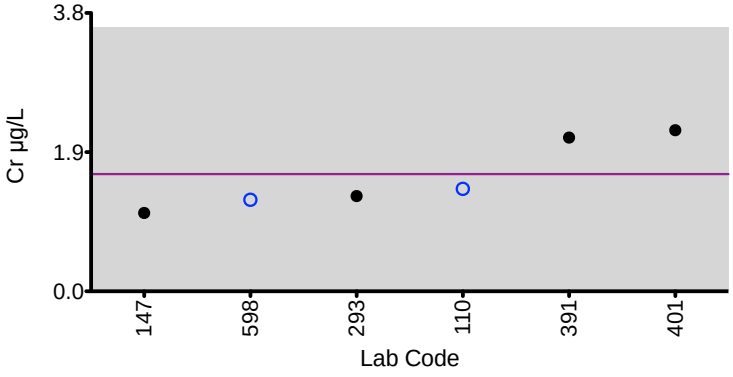
BE17-06



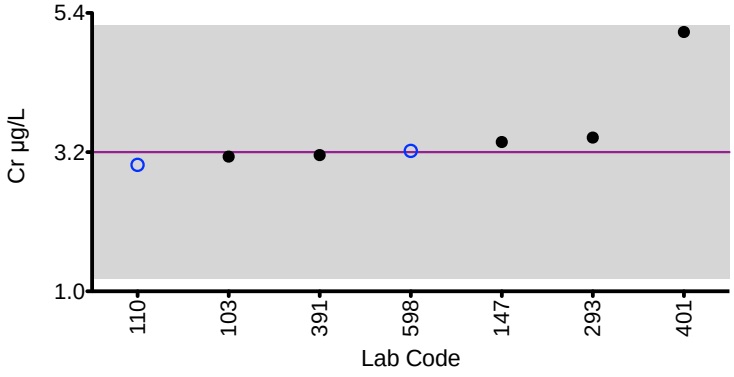
BE17-07



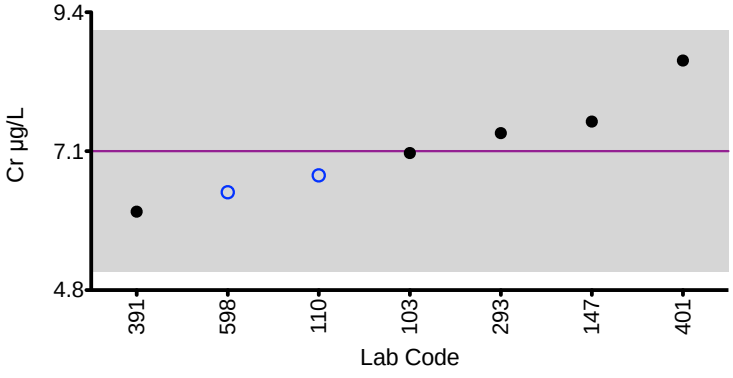
BE17-08



BE17-09



BE17-10



Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the arithmetic mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±2 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±2 µg/L at concentrations less than or equal to 10 µg/L.

Results for Event #2, 2017:
Summary Statistics

Whole Blood Hg (µg/L)					
	BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Target (Robust Mean (x*))	3.2	10.8	16.2	25.0	5.6
Upper Limit	6.2	14.0	21.1	32.5	8.6
Lower Limit	0.2	7.6	11.3	17.5	2.6
Robust SD (s*)	0.3	1.1	1.2	5.1	1.0
Robust RSD (%)	9.4	10.2	7.4	20.4	17.9
Number of Sample Measurements (N)	14	14	14	14	14
Standard Uncertainty (*u*)	0.11	0.35	0.40	1.69	0.33

The acceptable range is based on quality specifications:
±3 µg/L or ±30% around the target value, whichever is greater; thus, it is fixed at ±3 µg/L at concentrations less than or equal to 10 µg/L. These quality specifications were established by New York State Department of Health's Wadsworth Center, the PT Program organizer.

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Results for Event #2, 2017:
Performance of Participating Laboratories

Whole Blood Hg (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
	Target	**3.2**	**10.8**	**16.2**	**25.0**	**5.6**
103	DRC/CC-ICP-MS	3.11	12.0	16.0	24.1	6.70
107	DRC/CC-ICP-MS	3.8	13	17	30	6.5
110	ICP-MS	3.18	9.99	15.5	21.2	4.52
116	DRC/CC-ICP-MS	3.43	11.1	17.0	28.0	6.18
147	ICP-MS	2.80	9.58	15.9	21.3	5.83
293	DRC/CC-ICP-MS	3.15	11.26	16.79	24.21	5.75
391	CV-AAS	4.21	8.32	13.0	18.86	4.76
399	DRC/CC-ICP-MS	3.12	10.4	16.3	35.5 ↑	5.72
401	DRC/CC-ICP-MS	3.5	10.6	16.2	25.5	5.2
598	ICP-MS	2.99	9.71	14.5	19.1	4.37
599	DRC/CC-ICP-MS	2.55	11.2	13.2	21.3	3.98
605	ICP-MS	3.29	10.7	16.7	25.0	5.90
606	ICP-MS	3.43	12.2	18.1	32.3	8.38
686	ICP-MS	3.35	10.7	17.3	27.8	5.45

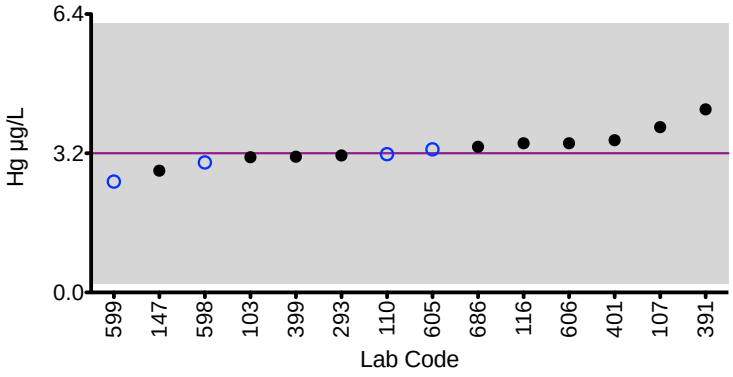
Based on the grading criteria for Hg in Whole Blood, 99% of results were satisfactory, with 0 of the 14 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

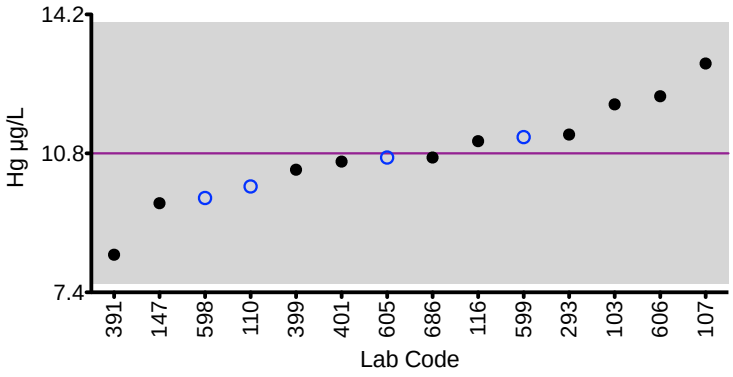
Results for Event #2, 2017:
Summary Figures

Whole Blood Hg

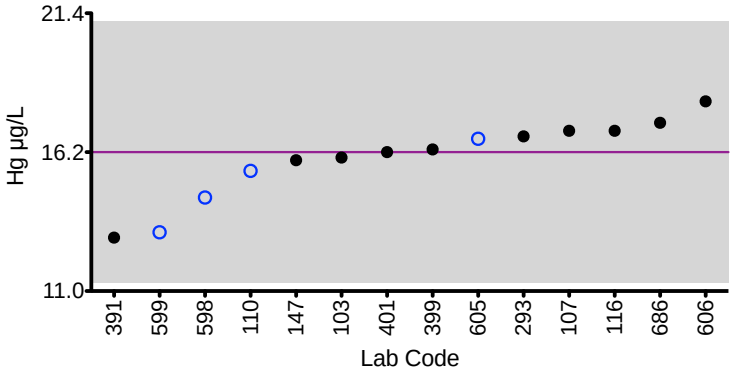
BE17-06



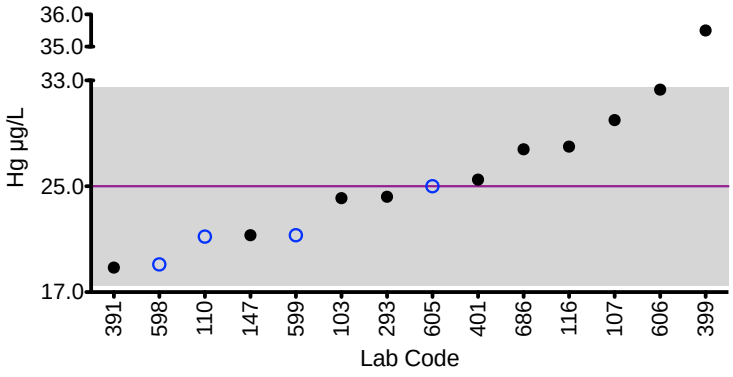
BE17-07



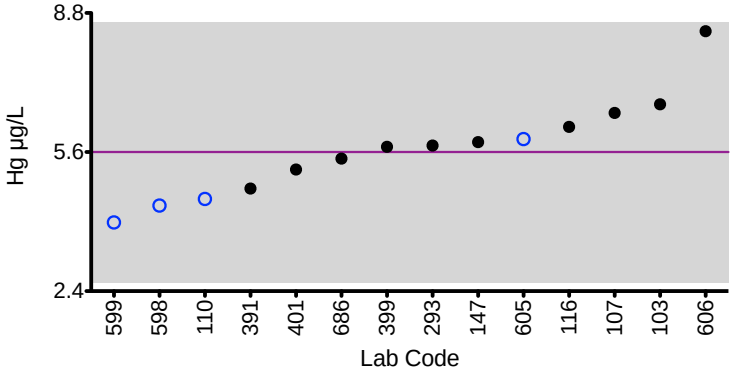
BE17-08



BE17-09



BE17-10



Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the robust mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±3 µg/L or ±30% around the target value, whichever is greater; thus, it is fixed at ±3 µg/L at concentrations less than or equal to 10 µg/L.

Results for Event #2, 2017:
Summary Statistics

Whole Blood Mn (µg/L)					
	BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Target (Robust Mean (x*))	34.0	12.9	5.7	11.3	18.4
Upper Limit	39.8	15.9	8.7	14.3	21.5
Lower Limit	28.2	9.9	2.7	8.3	15.3
Robust SD (s*)	2.6	1.3	0.9	1.5	1.1
Robust RSD (%)	7.6	10.1	15.8	13.3	6.0
Number of Sample Measurements (N)	12	12	12	12	12
Standard Uncertainty (*u*)	0.94	0.47	0.33	0.55	0.38

The acceptable range is based on quality specifications:
±3 µg/L or ±17% around the target value, whichever is greater; thus, it is fixed at ±3 µg/L at concentrations less than or equal to 17 µg/L. These quality specifications were recently proposed by a network of Trace Element PT program organizers (Praamsma M, et al. An assessment of clinical laboratory performance for the determination of manganese in blood and urine. Clinical Chemistry and Laboratory Medicine. 2016 In press.)

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Results for Event #2, 2017:
Performance of Participating Laboratories

Whole Blood Mn (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
	Target	**34.0**	**12.9**	**5.7**	**11.3**	**18.4**
103	DRC/CC-ICP-MS	35.8	13.7	5.69	12.0	19.3
107	DRC/CC-ICP-MS	35	13	5.7	12	19
110	ICP-MS	33.8	12.7	5.8	11.2	18.6
147	ICP-MS	34.9	13.7	6.54	12.5	18.6
293	DRC/CC-ICP-MS	32.61	10.70	4.25	8.84	16.71
391	DRC/CC-ICP-MS	30.662	13.799	7.8	12.345	18.131
399	DRC/CC-ICP-MS	34.8	12.7	5.61	11.6	18.7
401	DRC/CC-ICP-MS	36.5	13.6	5.7	11.3	19.1
597	ICP-MS	31.19	11.90	4.67	9.69	15.67
598	ICP-MS	33.6	12.7	5.88	10.3	17.2
599	DRC/CC-ICP-MS	44.0 ↑	15.9	6.88	14.5 ↑	23.7 ↑
606	DRC/CC-ICP-MS	30.3	10.4	4.32	9.37	14.9 ↓

Based on the grading criteria for Mn in Whole Blood, 93% of results were satisfactory, with 1 of the 12 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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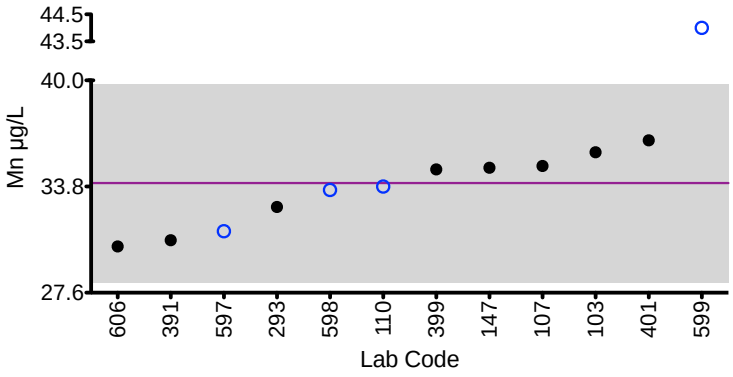
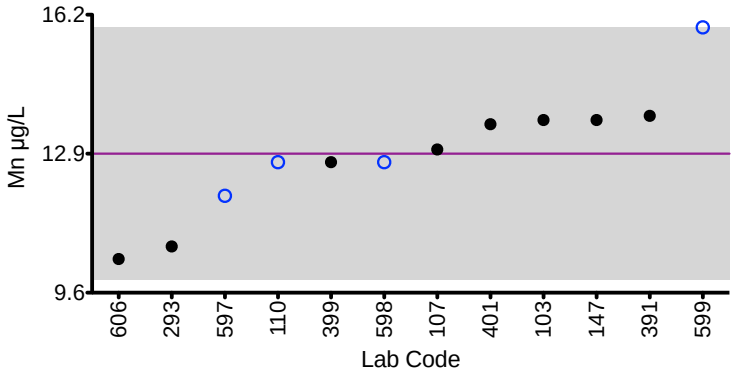
Results for Event #2, 2017: Summary Figures

Whole Blood Mn

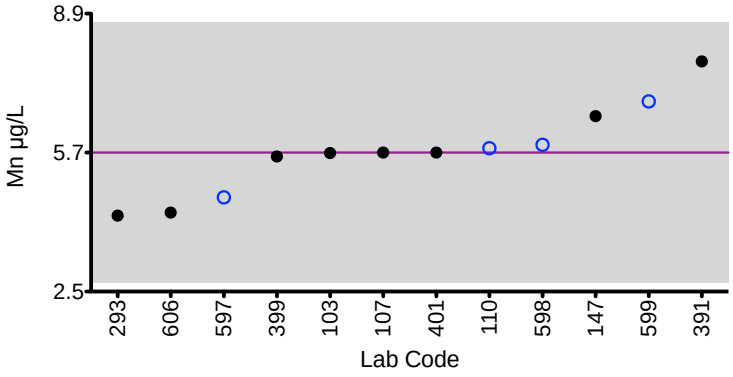
BE17-06



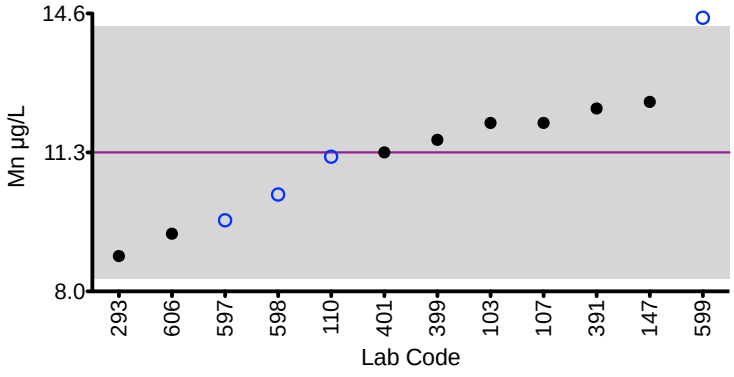
BE17-07



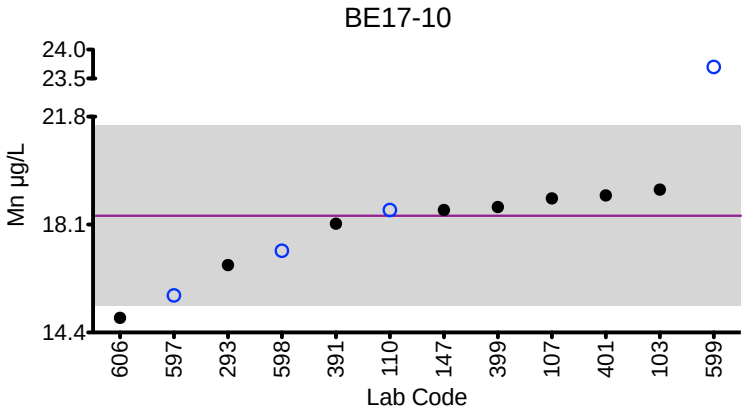
BE17-08



BE17-09



BE17-10



Legend:

○ C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the robust mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±3 µg/L or ±17% around the target value, whichever is greater; thus, it is fixed at ±3 µg/L at concentrations less than or equal to 17 µg/L.

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Results for Event #2, 2017: Summary Statistics

Whole Blood Pb (µg/dL)					
	BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Target (Robust Mean (x*))	3.61	11.6	2.17	26.1	21.4
Upper Limit	5.61	13.6	4.17	28.7	23.5
Lower Limit	1.61	9.6	0.17	23.5	19.3
Robust SD (s*)	0.30	0.6	0.16	1.4	1.8
Robust RSD (%)	8.3	5.2	7.4	5.4	8.4
Number of Sample Measurements (N)	15	15	14	15	15
Standard Uncertainty (*u*)	0.10	0.19	0.05	0.44	0.59

The acceptable range is based on quality specifications:
±2 µg/dL or ±10% around the target value, whichever is greater; thus, it is fixed at ±2 µg/dL at concentrations less than or equal to 20 µg/dL. These quality specifications are recommended by the Clinical Laboratory Standards Institute (CLSI, C40-A2) and have been proposed for use in proficiency testing programs approved under CLIA by the Centers for Medicare and Medicaid Services (CMS) in the USA. (http://shop.clsi.org/C40.html)

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Results for Event #2, 2017:
Performance of Participating Laboratories

Whole Blood Pb (µg/dL)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
	Target	**3.61**	**11.6**	**2.17**	**26.1**	**21.4**
103	DRC/CC-ICP-MS	3.79	12.0	2.24	26.7	22.1
107	ICP-MS	3.9	12	2.3	27	22
110	ICP-MS	3.85	11.7	2.31	25.9	21.0
116	DRC/CC-ICP-MS	3.65	11.7	2.17	26.3	21.5
147	ICP-MS	3.38	11.1	2.07	23.8	20.1
200	ICP-MS	3.3	11.0	2.1	23.8	18.8 ↓
293	DRC/CC-ICP-MS	*37.42 ↑	*118.5 ↑	*22.87 ↑	*259.88 ↑	*214.14 ↑
343	ASV-LeadCare	2.40	10.9	<1.9	26.8	21.4
391	ETAAS-Z	3.46	13	1.35	30.5 ↑	25.5 ↑
399	DRC/CC-ICP-MS	3.71	11.6	2.21	26.1	21.6
401	DRC/CC-ICP-MS	3.5	11.2	2.1	25.0	20.4
597	ICP-MS	3.28	10.76	1.93	22.76 ↓	19.07 ↓
598	ICP-MS	4.03	11.10	2.37	22.9 ↓	18.3 ↓
599	DRC/CC-ICP-MS	*32.6 ↑	*101 ↑	*18.9 ↑	*220 ↑	*187 ↑
605	ICP-MS	3.86	12.1	2.29	27.1	23.6 ↑
606	ICP-MS	3.42	11.9	2.04	26.8	23.5
686	ICP-MS	3.83	12.1	2.32	27.6	22.3

Based on the grading criteria for Pb in Whole Blood, 79% of results were satisfactory, with 5 of the 17 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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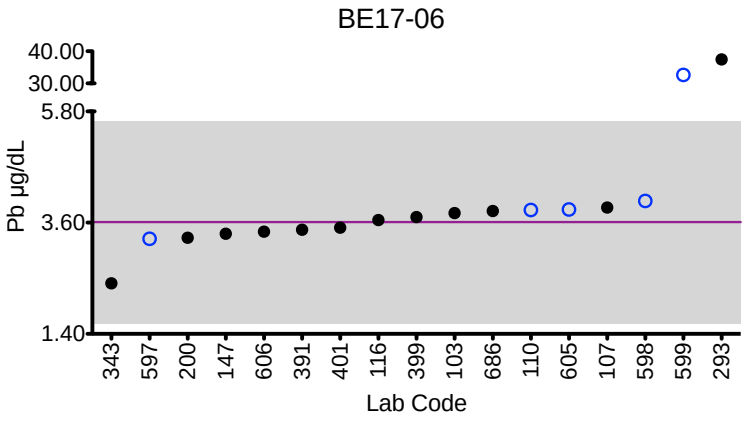
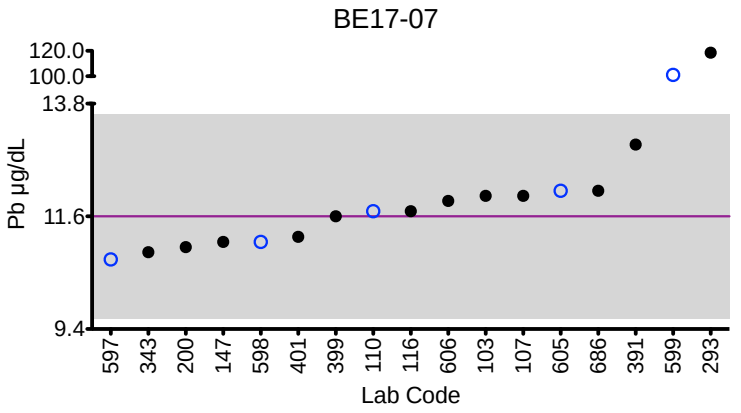
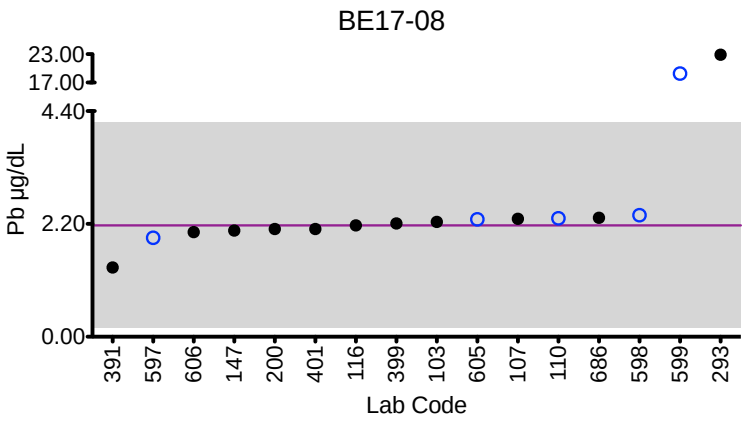
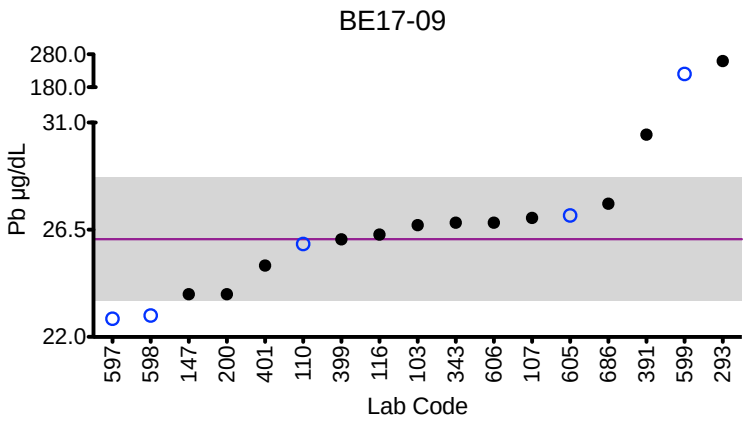
Results for Event #2, 2017: Summary Figures

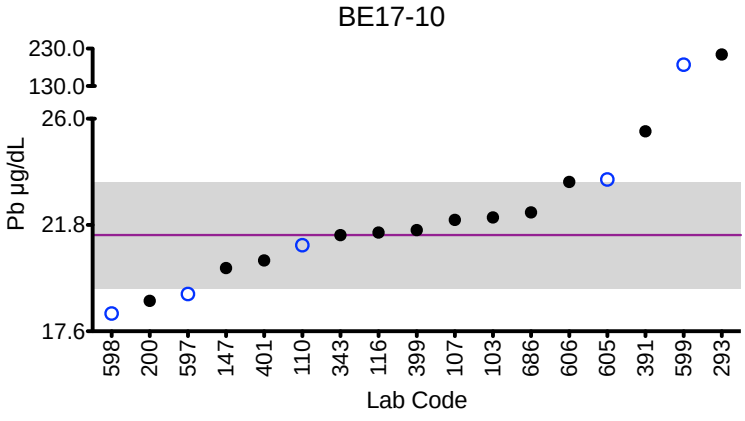
Whole Blood Pb











Legend:

○ C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the robust mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±2 µg/dL or ±10% around the target value, whichever is greater; thus, it is fixed at ±2 µg/dL at concentrations less than or equal to 20 µg/dL.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Whole Blood Ba (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
110	ICP-MS	10.4	4.8	3.0	2.4	0.7
147	ICP-MS	9.55	4.49	2.83	2.36	0.650
597	ICP-MS	10.07	4.43	2.69	2.45	0.59
598	ICP-MS	11.8	4.97	3.17	2.91	1.41
599		11.5	5.91	*4.61	3.91	1.98
Summary Statistics						
		BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Arithmetic Mean ($\bar{x}$)		10.7	4.9	2.9	2.8	1.1
Arithmetic SD (s)		1.0	0.6	0.2	0.7	0.6
Arithmetic RSD (%)		9.3	12.2	6.9	25.0	55
Number of Sample Measurements (N)		5	5	4	5	5

*Denotes a statistical Outlier.

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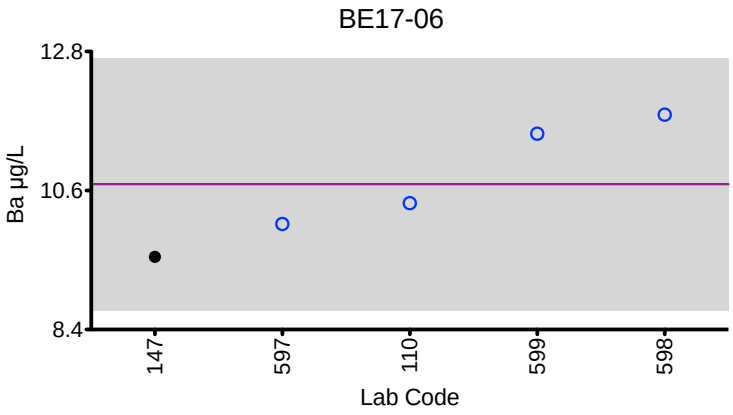
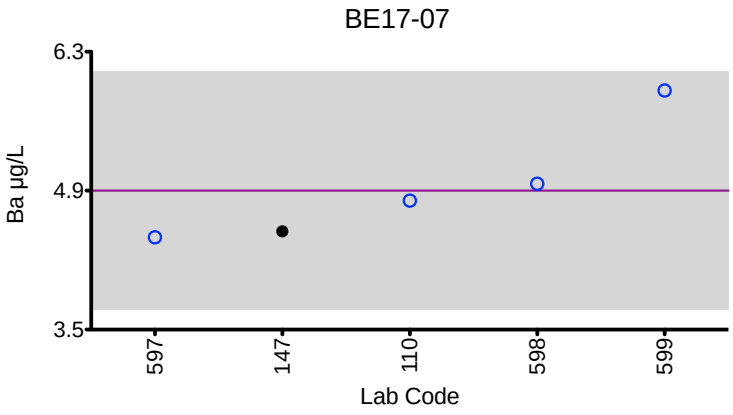
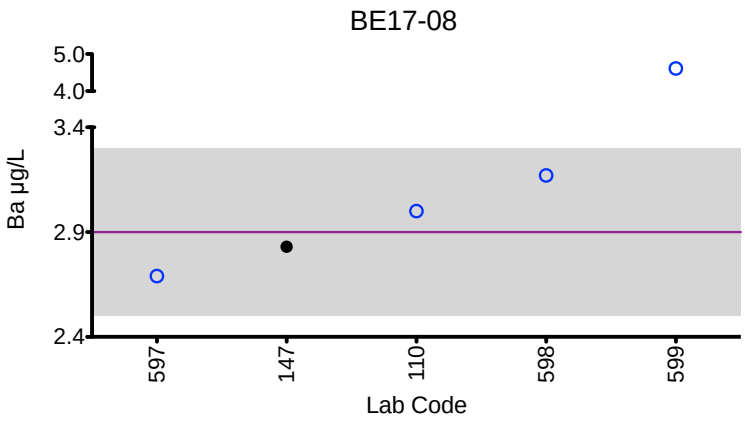
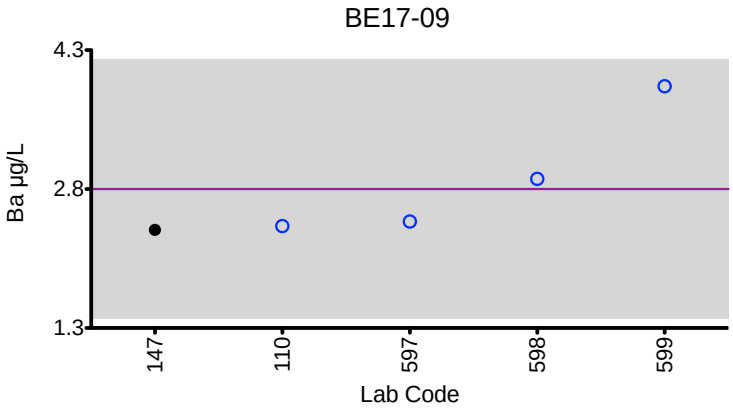
Results for Event #2, 2017: Summary Figures

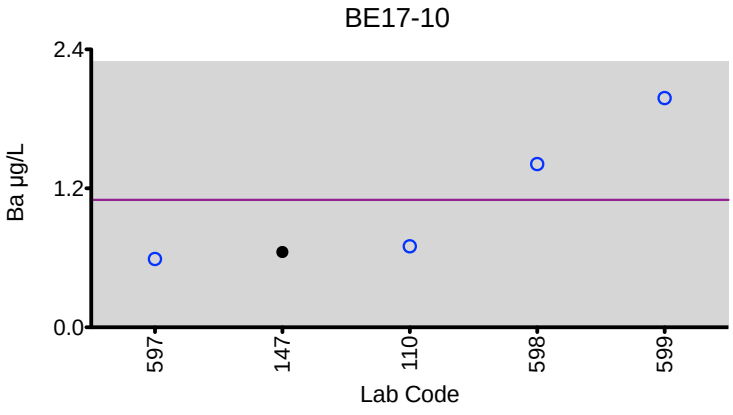
Whole Blood Ba











Legend:
o C/HHEAR Labs ● Other Labs
Horizontal purple line = arithmetic mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Whole Blood Cu (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
110	ICP-MS	692	1620	1290	927	1700
147	ICP-MS	839	1842	1442	1061	1925
597	ICP-MS	728.30	1676.16	1287.46	928.51	1682.01
598	ICP-MS	656	1520	1190	872	1560
599		877	2180	1640	1190	2190
Summary Statistics						
		BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Arithmetic Mean ($\bar{x}$)		758	1768	1370	996	1811
Arithmetic SD (s)		95	258	176	129	249
Arithmetic RSD (%)		12.5	14.6	12.8	13.0	13.7
Number of Sample Measurements (N)		5	5	5	5	5

*Denotes a statistical Outlier.

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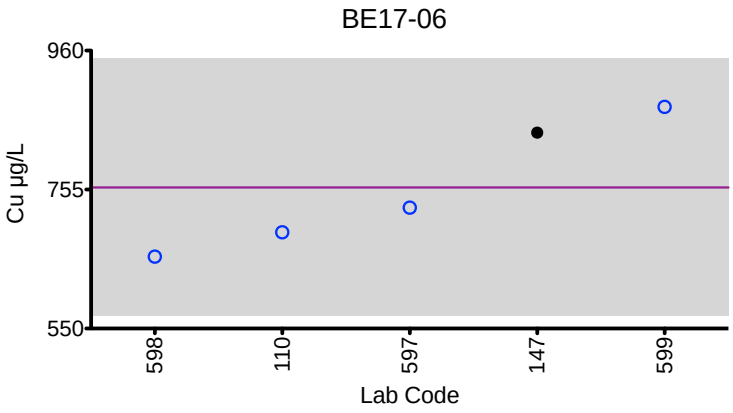
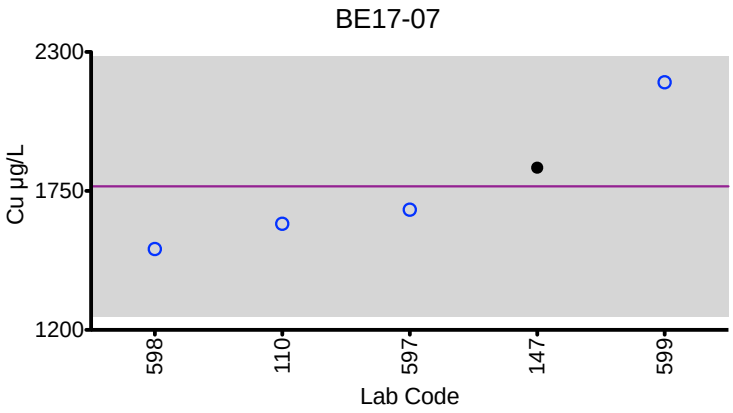
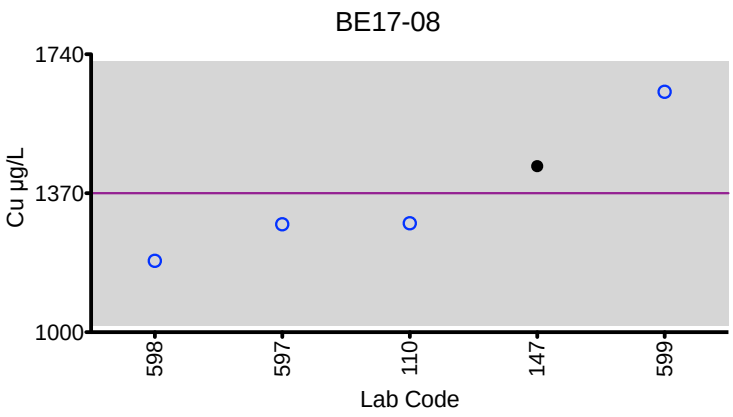
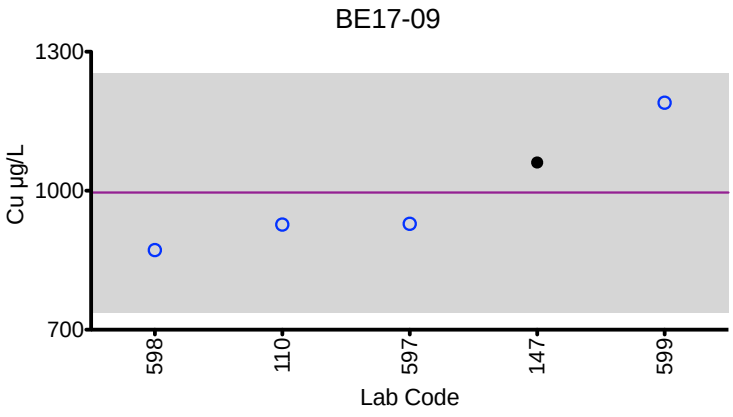
Results for Event #2, 2017: Summary Figures

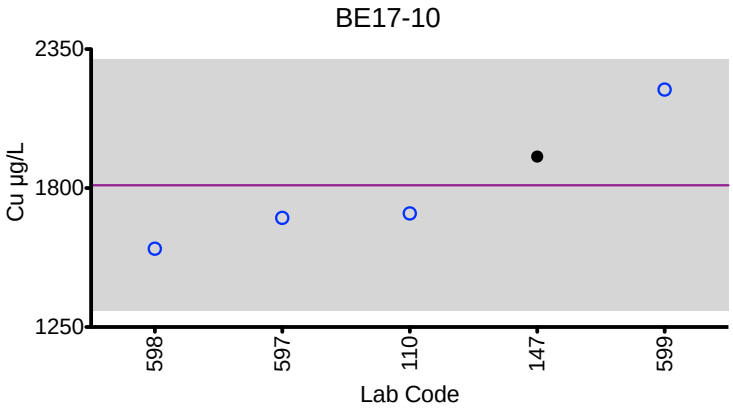
Whole Blood Cu











Legend:
o C/HHEAR Labs ● Other Labs
Horizontal purple line = arithmetic mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Whole Blood Mo (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
103	DRC/CC-ICP-MS	7.57	9.67	0.809	2.71	4.65
147	ICP-MS	6.87	8.56	0.875	2.49	4.34
597	ICP-MS	6.55	7.85	0.78	2.20	3.70
598	DRC/CC-ICP-MS	9.59	10.30	*2.44	*3.97	5.83
599		7.02	8.48	0.90	2.40	4.01

Summary Statistics					
	BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Arithmetic Mean ($\bar{x}$)	7.52	8.97	0.841	2.45	4.51
Arithmetic SD (s)	1.21	0.99	0.056	0.21	0.82
Arithmetic RSD (%)	16.1	11.0	6.7	8.6	18.2
Number of Sample Measurements (N)	5	5	4	4	5

*Denotes a statistical Outlier.

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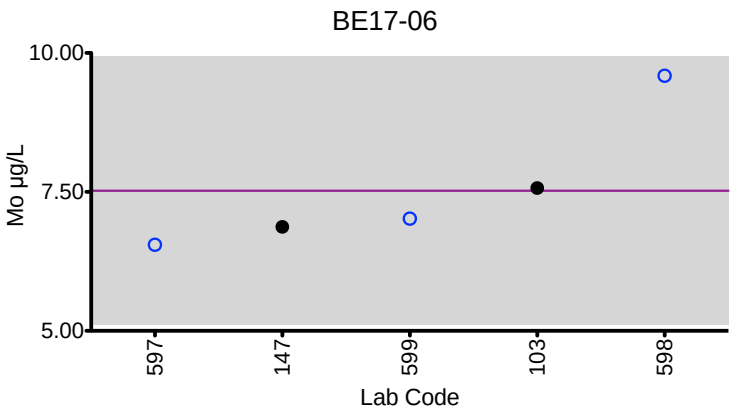
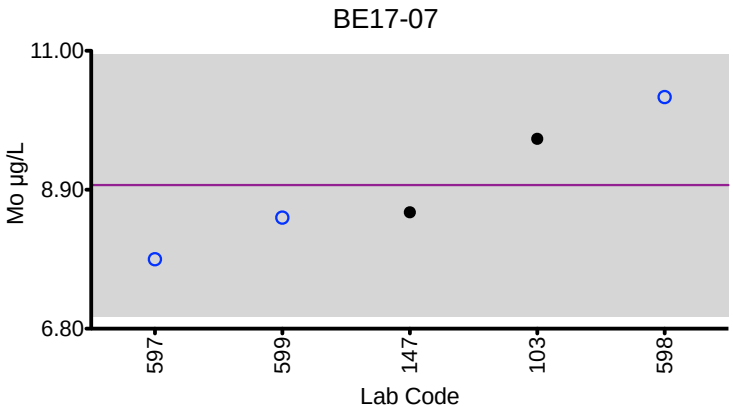
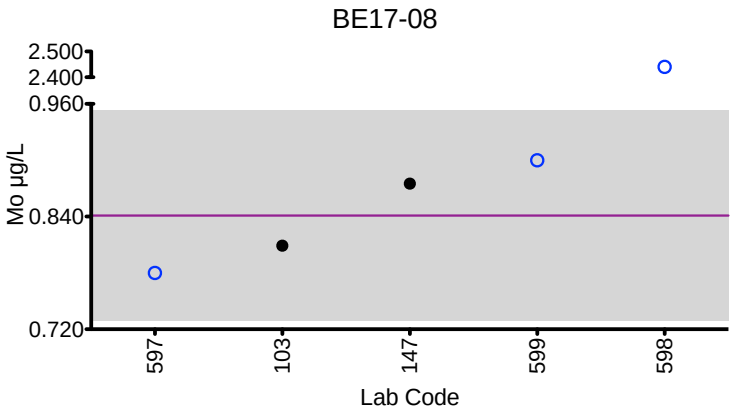
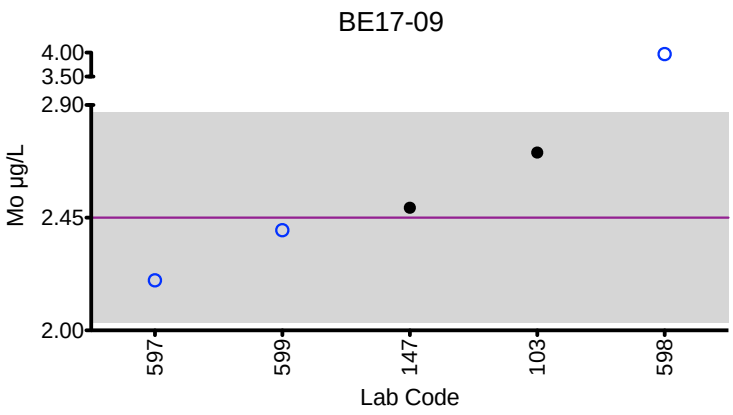
Results for Event #2, 2017:
Summary Figures

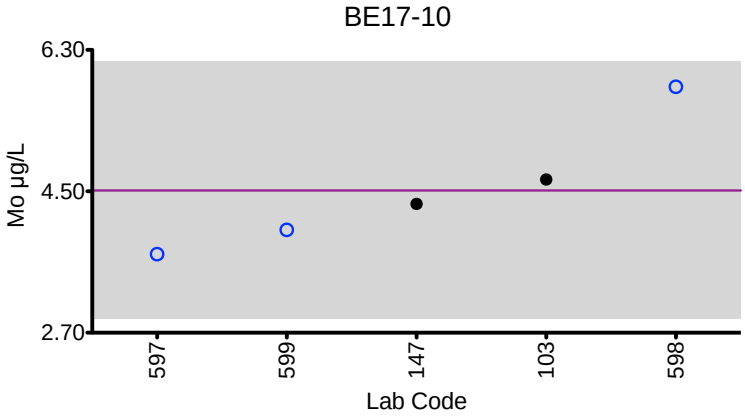
Whole Blood Mo











Legend:
o C/HHEAR Labs ● Other Labs
Horizontal purple line = arithmetic mean of all laboratories.
Gray area = ±2SD of the mean.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Whole Blood Sb (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
103	DRC/CC-ICP-MS	1.39	5.50	1.02	3.81	0.730
110	ICP-MS	1.44	5.45	1.04	3.58	0.75
147	ICP-MS	1.16	4.58	0.912	3.02	0.661
597	ICP-MS	1.53	5.10	1.44	3.62	*1.44
598	ICP-MS	1.58	5.29	1.09	3.72	0.78
599		1.59	4.99	1.25	3.51	0.95
Summary Statistics						
		BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Arithmetic Mean ($\bar{x}$)		1.45	5.15	1.13	3.54	0.77
Arithmetic SD (s)		0.16	0.34	0.19	0.28	0.11
Arithmetic RSD (%)		11.0	6.6	16.8	7.9	14.3
Number of Sample Measurements (N)		6	6	6	6	5

*Denotes a statistical Outlier.

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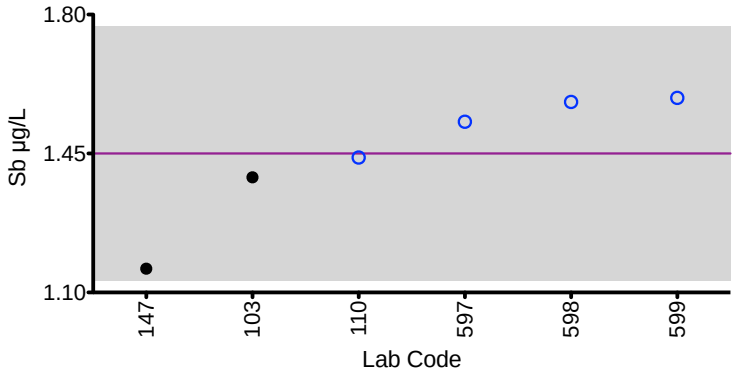
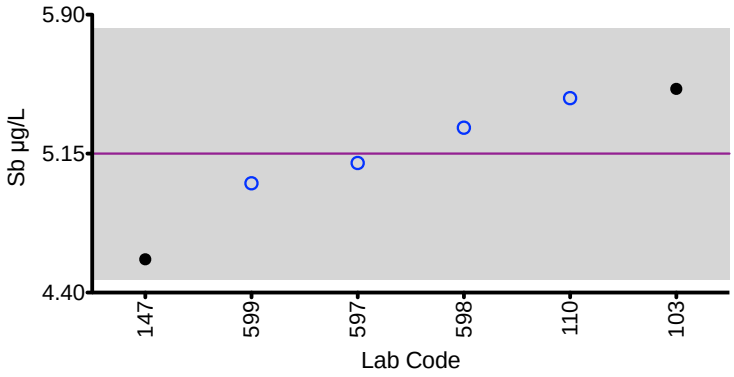
Results for Event #2, 2017: Summary Figures

Whole Blood Sb

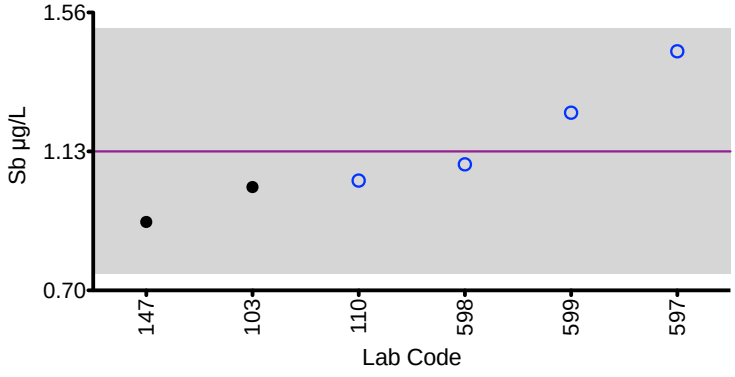
BE17-06



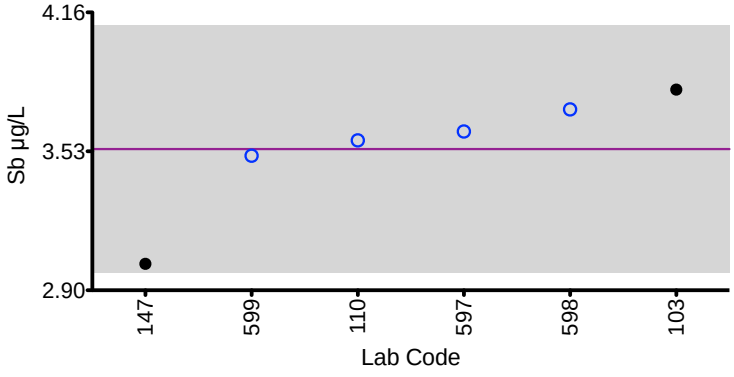
BE17-07



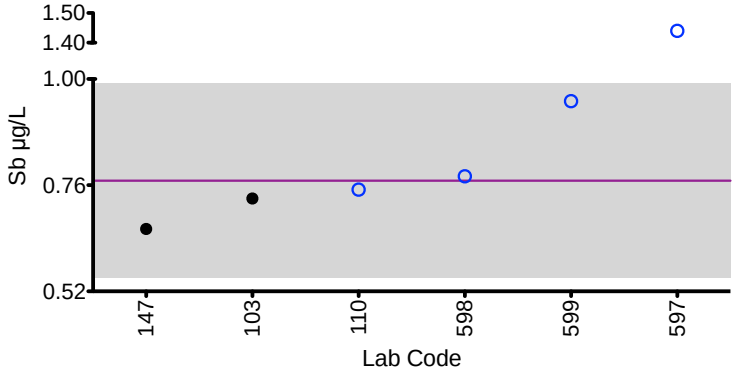
BE17-08



BE17-09



BE17-10



Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = arithmetic mean of all laboratories.

Gray area = ±2SD of the mean.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Whole Blood Se (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
103	DRC/CC-ICP-MS	153	257	272	205	186
107	DRC/CC-ICP-MS	170	270	310	230	200
110	DRC/CC-ICP-MS	140	222	269	195	180
147	ICP-MS	169	248	302	225	194
399	DRC/CC-ICP-MS	157.0	244.0	292.0	215.0	188.0
401	DRC/CC-ICP-MS	144	220	252	183	168
597	ICP-MS	139.35	220.96	248.16	178.68	157.17
598	DRC/CC-ICP-MS	181	288	318	245	211
Summary Statistics						
		BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Arithmetic Mean ($\bar{x}$)		157	246	283	210	186
Arithmetic SD (s)		15	25	26	23	17
Arithmetic RSD (%)		9.6	10.2	9.2	11.0	9.1
Number of Sample Measurements (N)		8	8	8	8	8

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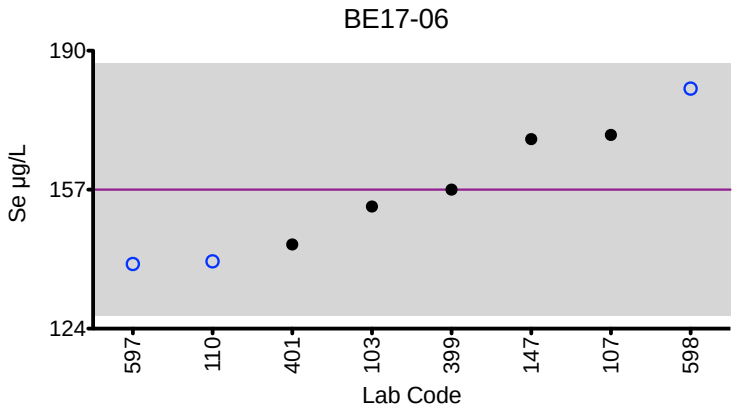
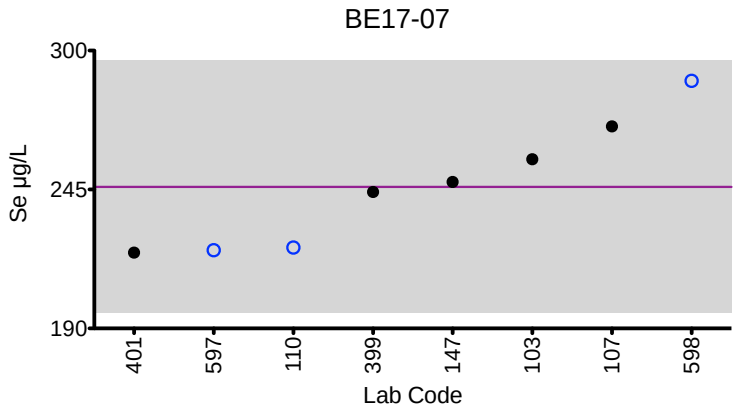
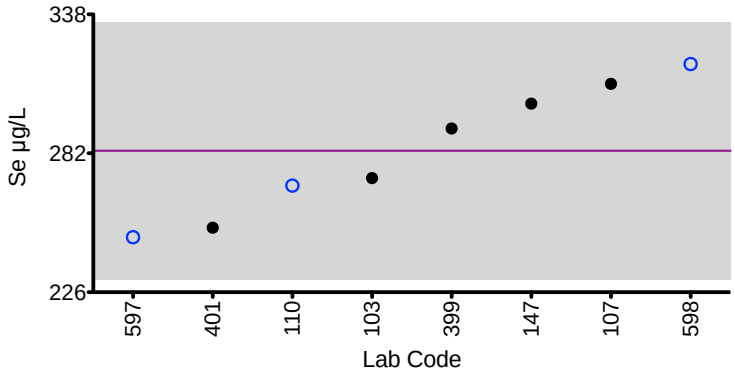
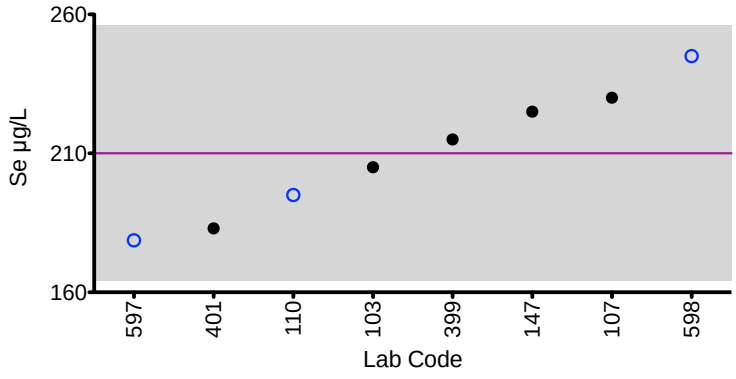
Results for Event #2, 2017: Summary Figures

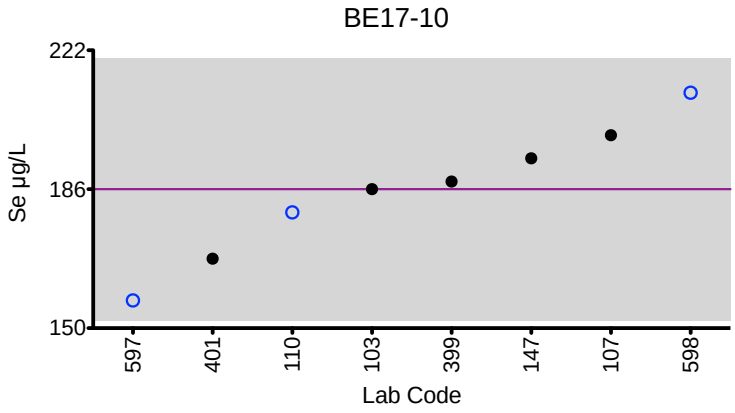
Whole Blood Se











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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Whole Blood Tl (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
103	DRC/CC-ICP-MS	0.245	0.463	0.0264	1.06	0.837
110	ICP-MS	0.23	0.46	0.02	1.05	0.80
147	ICP-MS	0.227	0.464	< 0.0348	1.06	0.816
597	ICP-MS	0.26	0.48	>0.08	*0.95	0.76
598	ICP-MS	0.30	0.48	0.06	1.08	*1.24
Summary Statistics						
		BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Arithmetic Mean ($\bar{x}$)		0.25	0.47	0.04	1.06	0.80
Arithmetic SD (s)		0.03	0.01	0.02	0.01	0.03
Arithmetic RSD (%)		12.0	2.1	50.0	0.94	3.8
Number of Sample Measurements (N)		5	5	3	4	4

*Denotes a statistical Outlier.

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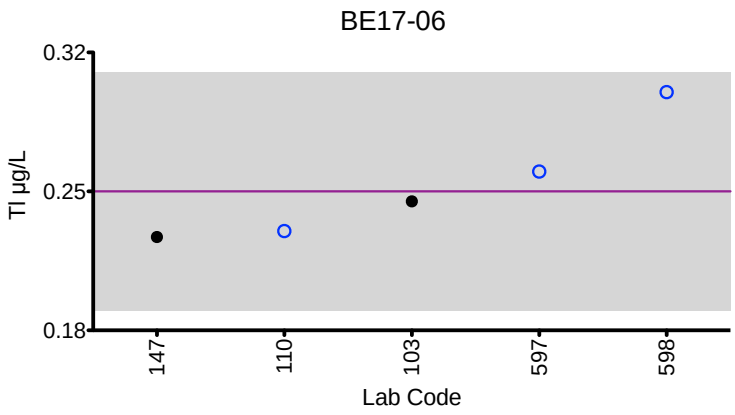
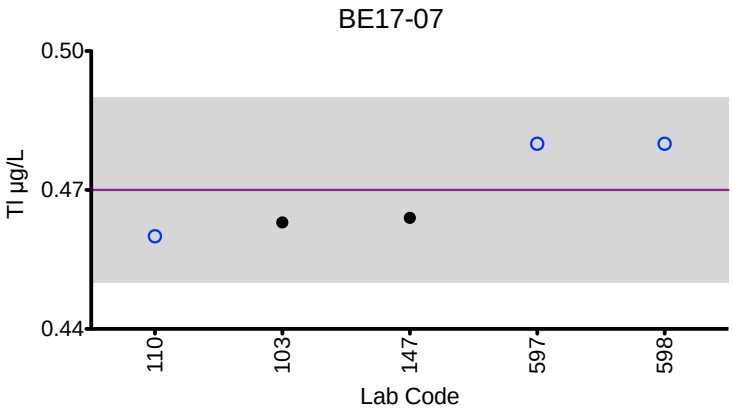
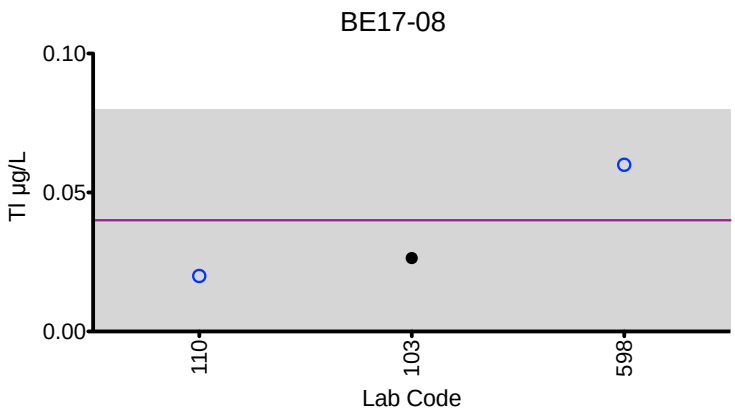
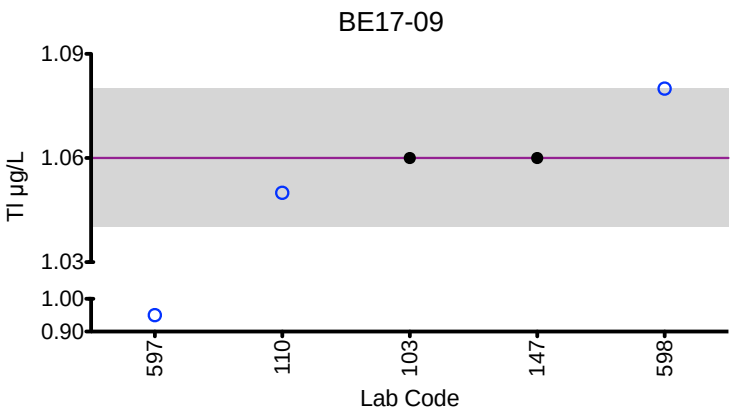
Results for Event #2, 2017: Summary Figures

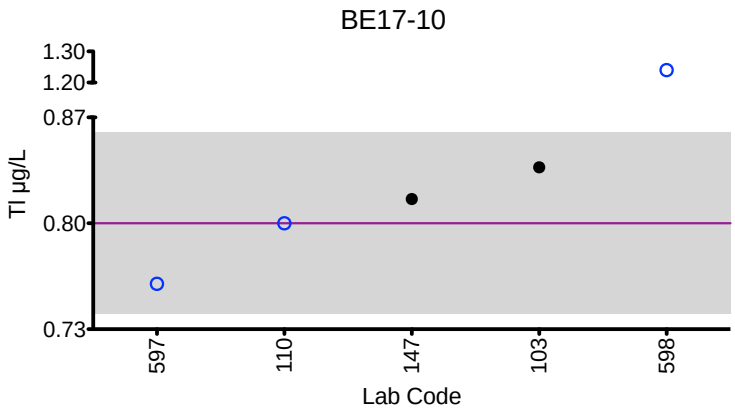
Whole Blood Tl











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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Whole Blood Zn (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
110	DRC/CC-ICP-MS	6600	5610	5140	6100	2800
147	ICP-MS	7451	5078	4706	6667	7516
597	ICP-MS	5830.71	5063.56	4516.29	5311.81	6099.72
598	ICP-MS	4830	4160	3910	4600	5530
599		8230	7090	6640	7530	9120
Summary Statistics						
		BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Arithmetic Mean ($\bar{x}$)		6588	5400	4982	6042	6213
Arithmetic SD (s)		1333	1079	1027	1142	2360
Arithmetic RSD (%)		20.2	20.0	20.6	18.9	38.0
Number of Sample Measurements (N)		5	5	5	5	5

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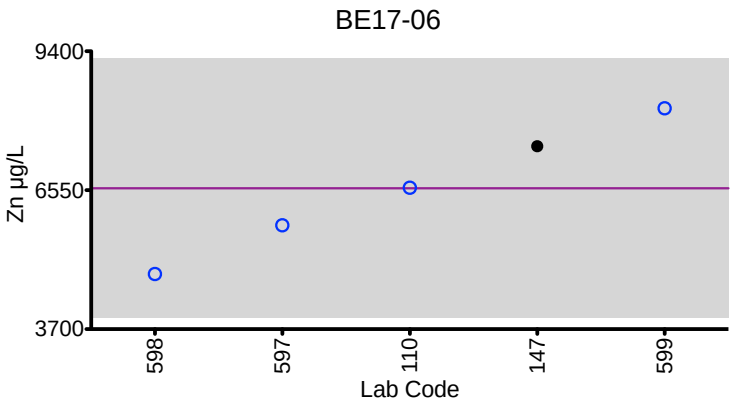
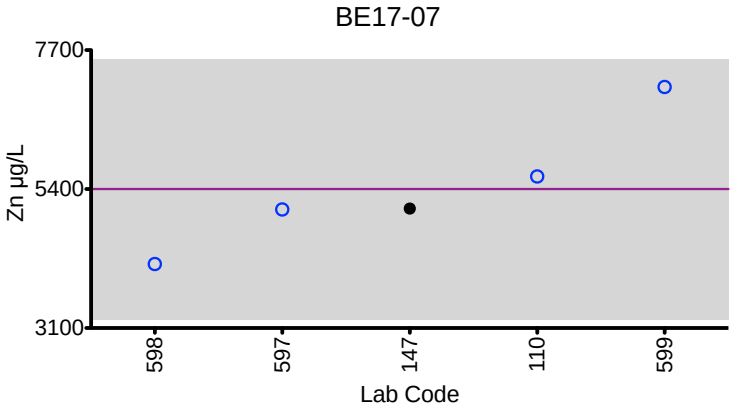
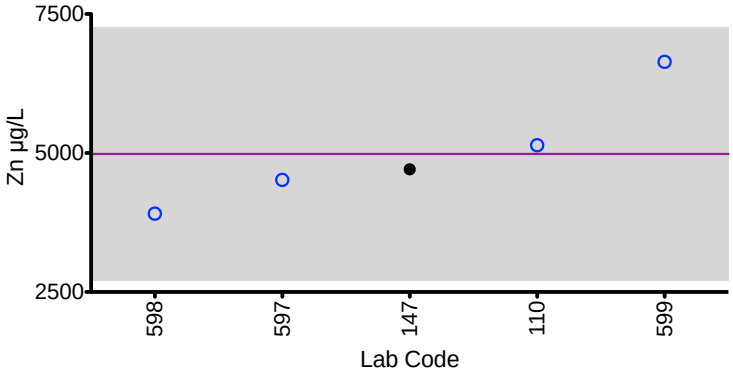
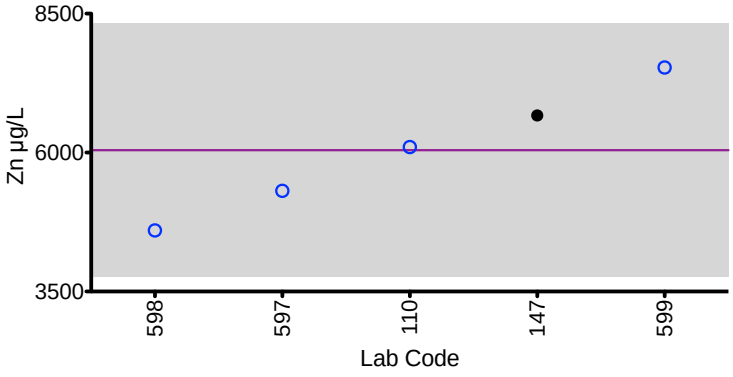
Results for Event #2, 2017: Summary Figures

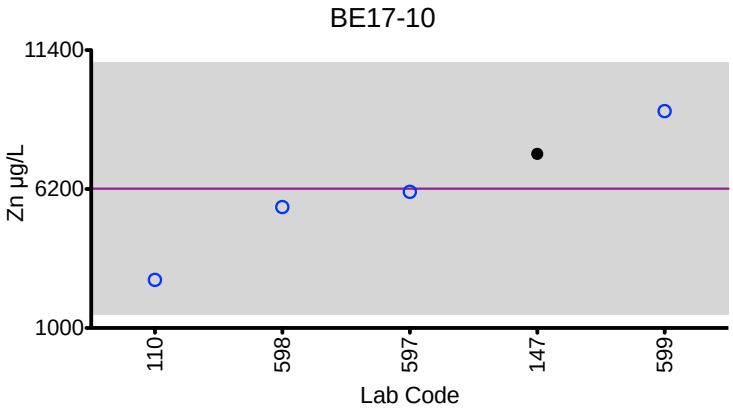
Whole Blood Zn











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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Whole Blood Be (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
110	ICP-MS	3.09	0.86	2.65	2.03	1.134
147	ICP-MS	2.95	1.25	3.04	2.15	1.50
598	ICP-MS	2.64	0.86	2.06	1.87	1.66
599		3.50	0.95	2.71	2.04	1.20
Summary Statistics						
		BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Arithmetic Mean ($\bar{x}$)		3.0	0.98	2.6	2.0	1.4
Arithmetic SD (s)		0.4	0.18	0.4	0.1	0.2
Arithmetic RSD (%)		13.3	18.4	15.4	5.0	14.3
Number of Sample Measurements (N)		4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Whole Blood Cs (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
110	ICP-MS	1.49	1.46	1.41	1.61	1.58
597	ICP-MS	1.42	1.52	1.46	1.57	1.59
598	ICP-MS	1.44	1.37	1.43	1.59	1.61
Summary Statistics						
		BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Arithmetic Mean ($\bar{x}$)		1.45	1.45	1.43	1.59	1.59
Arithmetic SD (s)		0.04	0.08	0.03	0.02	0.02
Arithmetic RSD (%)		2.7	5.5	2.1	1.3	1.3
Number of Sample Measurements (N)		3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Whole Blood Ni (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
110	DRC/CC-ICP-MS	6.9	2.1	4.2	3.5	9.2
147	ICP-MS	6.05	1.64	3.92	3.45	8.46
598	ICP-MS	7.17	4.71	4.95	4.31	10.9
Summary Statistics						
		BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Arithmetic Mean ($\bar{x}$)		6.7	2.8	4.4	3.8	9.5
Arithmetic SD (s)		0.6	1.7	0.5	0.5	1.3
Arithmetic RSD (%)		9.0	61	11.4	13.2	13.7
Number of Sample Measurements (N)		3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Whole Blood Pt (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
110	ICP-MS	5.1	0.6	1.9	<0.2	0.3
598	ICP-MS	5.20	0.70	2.04	0.15	0.27
599		6.27	0.82	2.30	0.06	0.39
Summary Statistics						
		BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Arithmetic Mean ($\bar{x}$)		5.5	0.71	2.1	0.11	0.32
Arithmetic SD (s)		0.6	0.11	0.2	0.06	0.06
Arithmetic RSD (%)		10.9	15.5	9.5	55.0	18.8
Number of Sample Measurements (N)		3	3	3	2	3

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Whole Blood Sn (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
110	ICP-MS	0.82	1.59	3.14	3.68	2.46
147	ICP-MS	0.537	1.25	2.57	3.10	1.92
597	ICP-MS	0.51	1.27	2.45	2.92	1.95
599		1.05	1.89	2.44	2.53	2.11
Summary Statistics						
		BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Arithmetic Mean ($\bar{x}$)		0.7	1.5	2.7	3.1	2.1
Arithmetic SD (s)		0.3	0.3	0.3	0.5	0.2
Arithmetic RSD (%)		42.9	20.0	11.1	16.1	9.5
Number of Sample Measurements (N)		4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Whole Blood U (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
103	DRC/CC-ICP-MS	0.0759	0.0347	< 0.0250	0.0772	0.0471
110	ICP-MS	0.075	0.036	0.018	0.083	0.038
147	ICP-MS	0.0698	0.0302	< 0.0138	0.0757	0.0412
598	ICP-MS	0.10	ND(0.05)	ND(0.05)	0.09	0.07
599		<0.1	<0.1	<0.1	<0.1	<0.1
Summary Statistics						
		BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Arithmetic Mean ($\bar{x}$)		0.080	0.034	NA	0.081	0.049
Arithmetic SD (s)		0.013	0.003	NA	0.006	0.014
Arithmetic RSD (%)		16.3	8.8	NA	7.4	28.6
Number of Sample Measurements (N)		4	3	NA	4	4

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Whole Blood V (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
110	DRC/CC-ICP-MS	<0.1	1.7	0.6	0.9	2.3
147	DRC/CC-ICP-MS	0.0279	1.89	0.648	0.847	2.70
598	DRC/CC-ICP-MS	0.10	1.68	0.47	0.70	2.32
Summary Statistics						
		BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Arithmetic Mean ($\bar{x}$)		0.06	1.76	0.57	0.82	2.44
Arithmetic SD (s)		0.05	0.12	0.09	0.10	0.23
Arithmetic RSD (%)		83.0	6.8	15.8	12.2	9.4
Number of Sample Measurements (N)		2	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Whole Blood W (µg/L)						
Lab Code	**Method**	**BE17-06**	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
110	ICP-MS	0.30	1.31	1.44	0.81	0.48
200	ICP-MS	0.3	1.3	1.6	0.9	0.6
598	ICP-MS	0.63	1.45	1.51	0.79	0.44
Summary Statistics						
		BE17-06	**BE17-07**	**BE17-08**	**BE17-09**	**BE17-10**
Arithmetic Mean ($\bar{x}$)		0.41	1.35	1.52	0.83	0.51
Arithmetic SD (s)		0.19	0.08	0.08	0.06	0.08
Arithmetic RSD (%)		46.3	5.9	5.3	7.2	15.7
Number of Sample Measurements (N)		3	3	3	3	3

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Results for Event #2, 2017:
Additional Elements in Whole Blood

Whole Blood Ag (µg/L)

Lab Code	Method	BE17-06	BE17-07	BE17-08	BE17-09	BE17-10
147	ICP-MS	< 0.205	< 0.205	< 0.205	< 0.205	< 0.205

Whole Blood Al (µg/L)

Lab Code	Method	BE17-06	BE17-07	BE17-08	BE17-09	BE17-10
147	ICP-MS	<9.17	<9.17	<9.17	<9.17	<9.17

Whole Blood Bi (µg/L)

Lab Code	Method	BE17-06	BE17-07	BE17-08	BE17-09	BE17-10
147	ICP-MS	< 0.0836	< 0.0836	< 0.0836	< 0.0836	< 0.0836

Whole Blood Ca (µg/L)

Lab Code	Method	BE17-06	BE17-07	BE17-08	BE17-09	BE17-10
598	ICP-AES/OES	46500	45600	45000	45300	43500

Whole Blood Fe (µg/L)

Lab Code	Method	BE17-06	BE17-07	BE17-08	BE17-09	BE17-10
598	ICP-AES/OES	349000	370000	348000	444000	432000

Whole Blood I (µg/L)

Lab Code	Method	BE17-06	BE17-07	BE17-08	BE17-09	BE17-10
147	ICP-MS	29.5	33.7	32.7	24.3	25.1

Whole Blood Li (µg/L)

Lab Code	Method	BE17-06	BE17-07	BE17-08	BE17-09	BE17-10
147	ICP-MS	0.258	0.315	0.321	0.402	0.404

Whole Blood Mg (µg/L)

Lab Code	Method	BE17-06	BE17-07	BE17-08	BE17-09	BE17-10
597	ICP-MS	26648.71	27814.44	26593.40	29134.55	28545.17

Whole Blood Sr (µg/L)

Lab Code	Method	BE17-06	BE17-07	BE17-08	BE17-09	BE17-10
103	DRC/CC-ICP-MS	22.0	22.8	21.8	16.6	16.6

Whole Blood Te (µg/L)

Lab Code	Method	BE17-06	BE17-07	BE17-08	BE17-09	BE17-10
147	ICP-MS	< 0.128	< 0.128	< 0.128	< 0.128	< 0.128

Whole Blood Th (µg/L)

Lab Code	Method	BE17-06	BE17-07	BE17-08	BE17-09	BE17-10
147	ICP-MS	< 0.0148	< 0.0148	< 0.0148	< 0.0148	< 0.0148

Whole Blood Ti (µg/L)

Lab Code	Method	BE17-06	BE17-07	BE17-08	BE17-09	BE17-10
200	DRC/CC-ICP-MS	4.6	5.0	2.3	9.8	1.1

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Event #2, 2017

Trace Elements in Urine

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NEW YORK STATE DEPARTMENT OF HEALTH
Trace Elements Laboratory

Event #2, 2017:
Trace Elements in Urine

PT Materials

Urine was collected from volunteer donors into polyethylene containers and stored at 4°C. Following collection, urine was acidified to 1% (v/v) with nitric acid and mixed with a sulfamic acid solution (stock solution contained 200 mg/mL sulfamic acid and 10% (v/v) Triton-X 100) to a final concentration of 1% (v/v) to stabilize Hg. Urine was stored frozen at -80°C pending further preparation. The urine was thawed at room temperature and precipitated salts removed by centrifugation. Urine supernatants were combined into five separate pools. Each urine pool was supplemented with arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), cobalt (Co), chromium (Cr), mercury (Hg), manganese (Mn), lead (Pb), thallium (Tl), uranium (U), aluminum (Al), cesium (Cs), copper (Cu), molybdenum (Mo), nickel (Ni), platinum (Pt), antimony (Sb), selenium (Se), tin (Sn), strontium (Sr), tellurium (Te), vanadium (V), tungsten (W), and zinc (Zn) and stirred overnight to ensure thorough mixing prior to aliquoting 10-mL into polypropylene vials. PT samples were stored at -80°C until the week of the PT event, when they were thawed at 4°C prior to circulation to laboratories for analysis.

Graded Elements

Eleven elements in urine are formally graded: As, Ba, Be, Cd, Co, Cr, Hg, Mn, Pb, Tl, and U. Target values for the graded elements are assigned to these pools based on the robust mean calculated from data reported by all laboratories.

Additional Elements

An additional 24 elements (beyond the eleven graded) were reported by at least one participant: Ag, Al, B, Bi, Ca, Cs, Cu, Fe, I, Li, Mg, Mo, Ni, Pt, Sb, Se, Sn, Sr, Te, Th, Ti, V, W, Zn. These data are included here to provide a more complete characterization of the PT materials. All results reported by participant laboratories are tabulated and organized by lab code. The PT data are graphed for visual comparison purposes for all elements where at least five laboratories reported a value greater than the LOD. A statistical summary table is provided for samples where at least two comparable values were reported as above the LOD.

The summary statistics for the additional elements are provided for educational purposes only, i.e., no acceptable response is implied. However, it is expected that each laboratory would wish to investigate a potential source of bias if warranted by these data. Future events might result in additional elements becoming graded if a consensus can be reached regarding desired quality specifications.

Data reported for educational sample UE17-E1 were compiled and are shown at the end of the urine section and are provided for informational purposes only.

Results for Event #2, 2017:
Summary Statistics

	Urine As (µg/L)				
	UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Target (Robust Mean (x*))	12.7	42.0	61.3	136	5.9
Upper Limit	18.7	50.4	73.6	163	11.9
Lower Limit	6.7	33.6	49.0	109	0.0
Robust SD (s*)	0.8	2.6	3.7	6	0.5
Robust RSD (%)	6.3	6.2	6.0	4.4	8.5
Number of Sample Measurements (N)	21	21	21	21	20
Standard Uncertainty (*u*)	0.229	0.700	1.00	1.57	0.147

The acceptable range is based on quality specifications:
±6 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±6 µg/L at concentrations less than or equal to 30 µg/L. These quality specifications are based on the same criteria used by the US Centers for Disease Control Prevention (CDC) for public health labs participating in the Laboratory Response Network (LRN) PT program for Toxic Metals.

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Results for Event #2, 2017:
Performance of Participating Laboratories

Urine As (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
	Target	**12.7**	**42**	**61.3**	**136**	**5.9**
103	DRC/CC-ICP-MS	12.8	43.2	63.3	137	5.84
107	ICP-MS	12	40	58	130	5.6
110	DRC/CC-ICP-MS	12.7	44.4	66.2	140	6.4
116	DRC/CC-ICP-MS	12.7	44.1	65.8	143	5.99
147	ICP-MS	11.2	36.6	53.8	119	5.02
200	ICP-MS	9.8	40.5	57.8	134	6.0
293	DRC/CC-ICP-MS	12.0	40.0	58.7	129.9	5.5
324	ICP-MS	12.69	42.15	62.28	139.26	5.82
391	DRC/CC-ICP-MS	12.5	40.6	58.0	134.2	5.9
399	DRC/CC-ICP-MS	12.8	42.0	61.9	138	6.02
401	DRC/CC-ICP-MS	14	43	63	137	6
597	ICP-MS	11.2	36.2	51.7	122.5	5.3
598	DRC/CC-ICP-MS	12.9	44.4	64.1	142	6.25
599	DRC/CC-ICP-MS	14.6	45.7	65.2	146	7.40
604	DRC/CC-ICP-MS	11.8	39.2	58.1	130	5.13
605	ICP-MS	12.2	39.5	59.3	133	5.44
606	ICP-MS	13.1	43.5	64.3	142	5.97
630	ICP-MS	12.6	42.1	62.2	137	6.20
632	DRC/CC-ICP-MS	14.0	45.0	64.5	139	8.57
684	DRC/CC-ICP-MS	13.9	43.0	61.0	135	7.39
686	DRC/CC-ICP-MS	12.9	43.4	62.1	141	<6.00

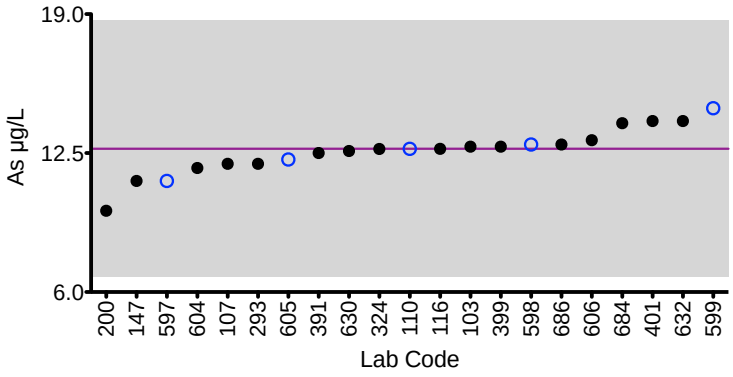
Based on the grading criteria for As in Urine, 100% of results were satisfactory, with 0 of the 21 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

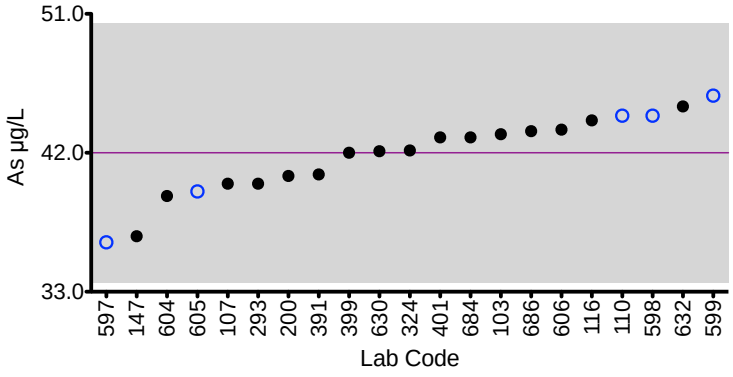
Results for Event #2, 2017:
Summary Figures

Urine As

UE17-06



UE17-07



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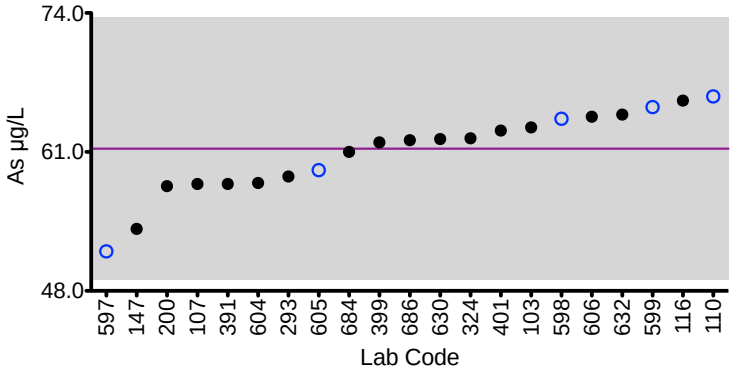

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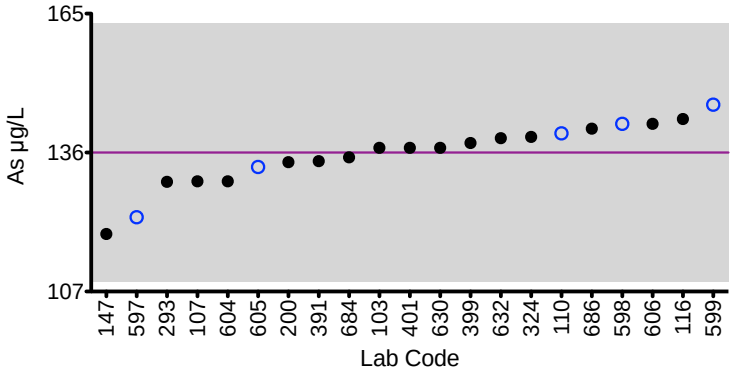

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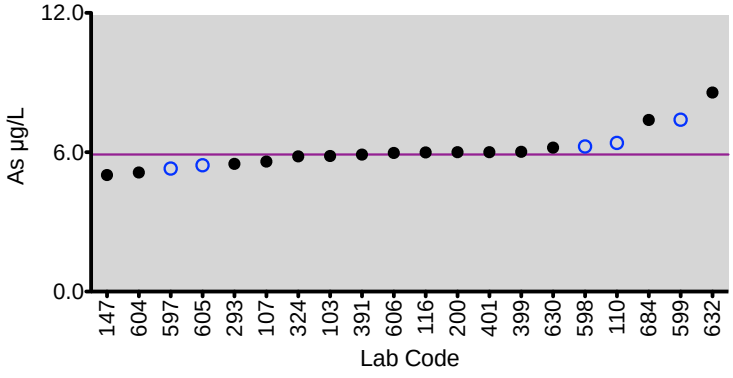

Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the robust mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±6 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±6 µg/L at concentrations less than or equal to 30 µg/L.

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Results for Event #2, 2017: Summary Statistics

Urine Ba (µg/L)					
	UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Target (Robust Mean (x*))	1.5	4.2	6.3	6.9	0.6
Upper Limit	2.5	5.2	7.6	8.3	1.6
Lower Limit	0.5	3.2	5.0	5.5	0.0
Robust SD (s*)	0.2	0.2	0.3	0.4	0.1
Robust RSD (%)	13.3	4.8	4.8	5.8	16.7
Number of Sample Measurements (N)	13	13	13	13	12
Standard Uncertainty (*u*)	0.05	0.08	0.12	0.14	0.03

The acceptable range is based on quality specifications:
±1 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±1 µg/L at concentrations less than or equal to 5 µg/L. These quality specifications are based on the same criteria used by the US Centers for Disease Control Prevention (CDC) for public health labs participating in the Laboratory Response Network (LRN) PT program for Toxic Metals.

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Results for Event #2, 2017:
Performance of Participating Laboratories

		Urine Ba (µg/L)				
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
	Target	**1.5**	**4.2**	**6.3**	**6.9**	**0.6**
107	ICP-MS	1.5	4.1	5.7	6.4	0.64
110	ICP-MS	1.6	4.3	6.4	7.1	0.6
116	DRC/CC-ICP-MS	1.23	3.98	6.12	6.17	0.242
147	ICP-MS	1.44	3.97	6.10	6.62	0.573
399	ICP-MS	1.62	4.26	6.40	7.01	0.656
597	ICP-MS	1.33	3.76	5.41	5.98	0.57
598	ICP-MS	1.72	4.63	6.65	7.36	0.77
599	DRC/CC-ICP-MS	1.64	4.44	6.50	6.85	0.705
605	ICP-MS	1.48	4.02	6.06	6.57	0.552
606	ICP-MS	1.54	4.35	6.46	7.26	0.647
607	ICP-MS	1.63	4.37	6.72	7.25	0.667
632	ICP-MS	1.43	4.3.0	6.53	7.08	<0.6
686	ICP-MS	1.69	4.41	6.57	7.24	0.760

Based on the grading criteria for Ba in Urine, 100% of results were satisfactory, with 0 of the 13 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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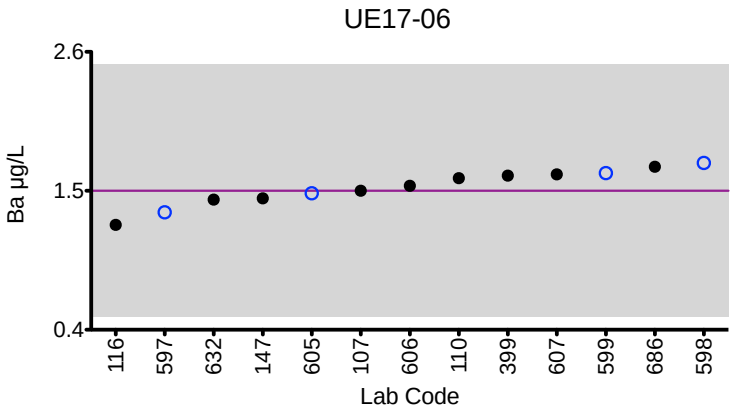
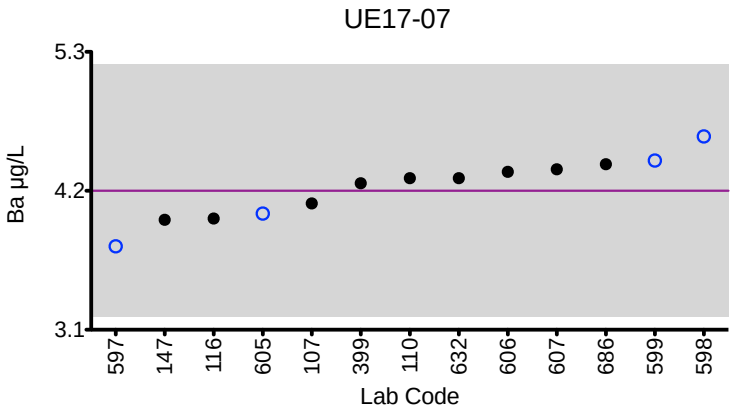
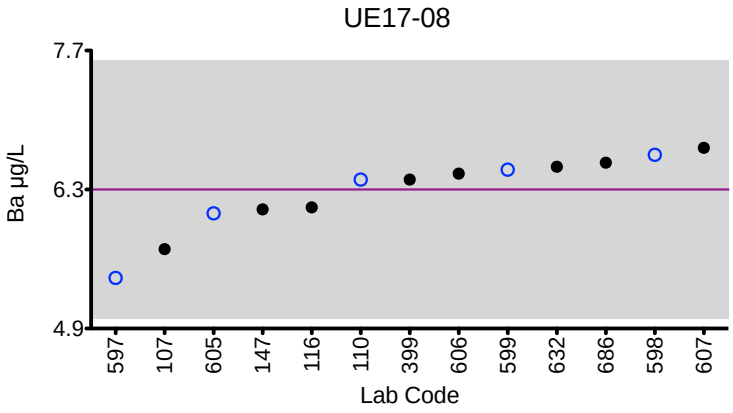
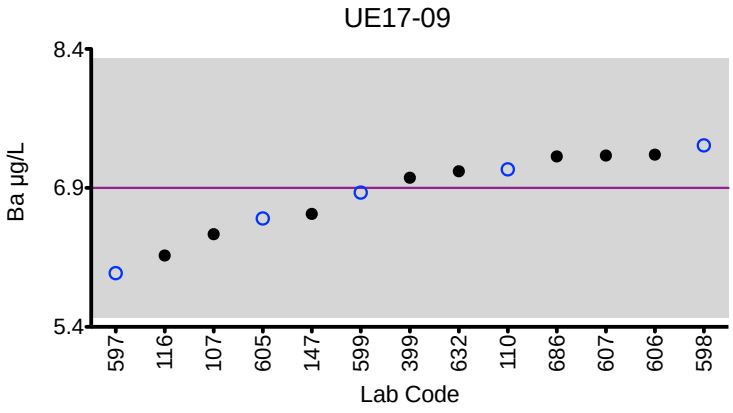
Results for Event #2, 2017: Summary Figures

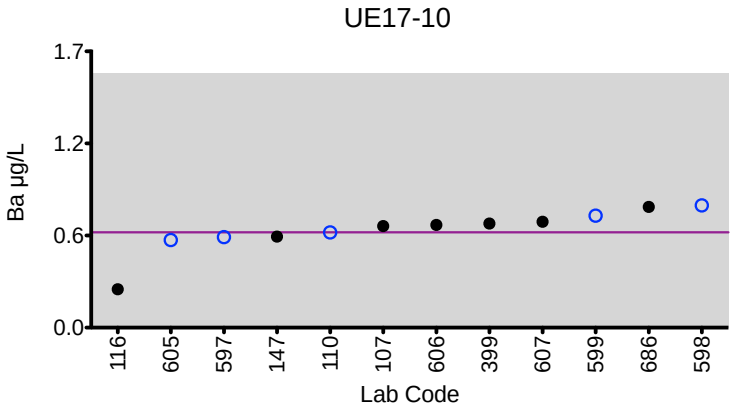
Urine Ba











Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the robust mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±1 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±1 µg/L at concentrations less than or equal to 5 µg/L.

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Results for Event #2, 2017: Summary Statistics

	Urine Be (µg/L)				
	UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Target (Robust Mean (x*))	0.58	2.4	3.0	0.46	2.2
Upper Limit	1.58	3.4	4.0	1.46	3.2
Lower Limit	0.00	1.4	2.0	0.00	1.2
Robust SD (s*)	0.03	0.1	0.2	0.06	0.1
Robust RSD (%)	5.2	4.2	6.7	13.0	4.5
Number of Sample Measurements (N)	11	11	11	10	11
Standard Uncertainty (*u*)	0.01	0.05	0.08	0.02	0.04

The acceptable range is based on quality specifications:
±1 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±1 µg/L at concentrations less than or equal to 5 µg/L. These quality specifications are based on the same criteria used by the US Centers for Disease Control Prevention (CDC) for public health labs participating in the Laboratory Response Network (LRN) PT program for Toxic Metals.

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Results for Event #2, 2017:
Performance of Participating Laboratories

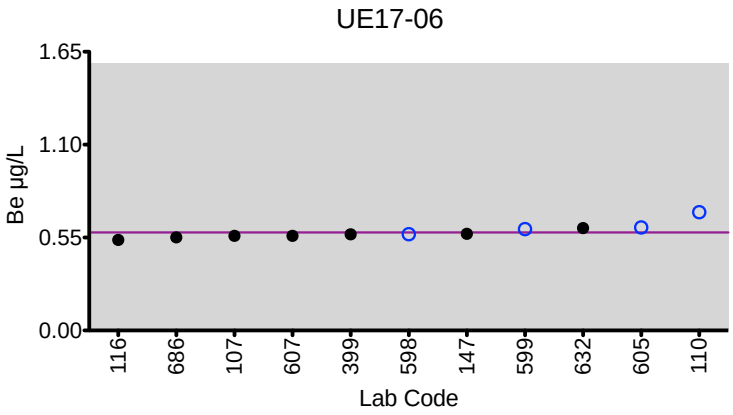
		Urine Be (µg/L)				
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
	Target	**0.58**	**2.4**	**3.0**	**0.46**	**2.2**
107	ICP-MS	0.56	2.3	2.8	0.41	2.1
110	ICP-MS	0.7	2.3	3.2	0.7	2.1
116	ICP-MS	0.536	2.33	2.94	0.418	1.97
147	ICP-MS	0.572	2.44	2.93	< 0.450	2.23
399	ICP-MS	0.569	2.43	3.01	0.450	2.14
598	ICP-MS	0.57	2.48	3.10	0.46	2.18
599	DRC/CC-ICP-MS	0.60	2.65	3.49	0.50	2.56
605	ICP-MS	0.61	2.45	3.06	0.453	2.15
607	ICP-MS	0.560	2.28	2.76	0.349	2.04
632	ICP-MS	0.606	2.58	3.23	0.502	2.28
686	ICP-MS	0.551	2.44	3.08	0.476	2.23

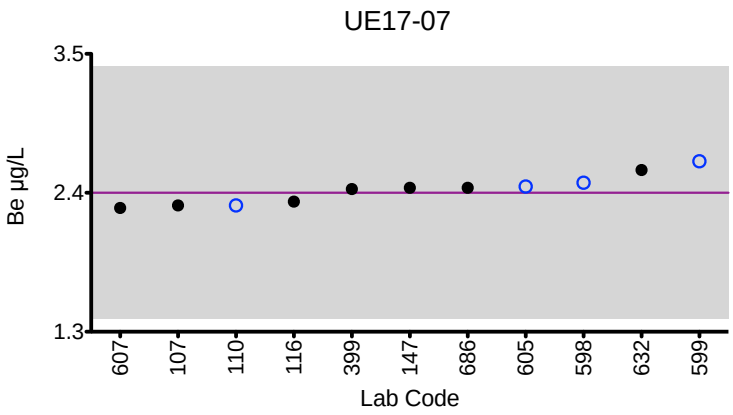
Based on the grading criteria for Be in Urine, 100% of results were satisfactory, with 0 of the 11 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

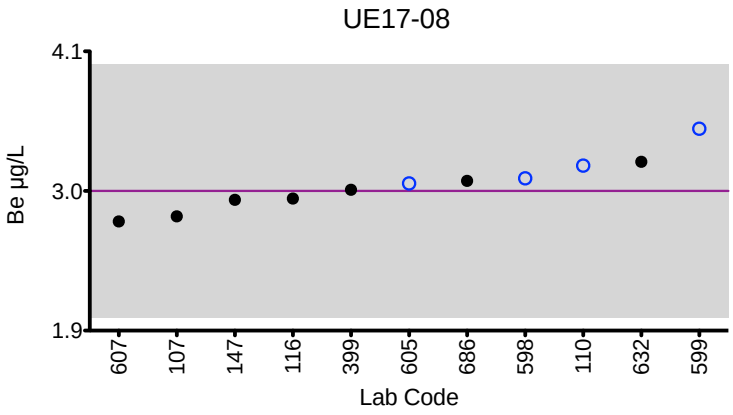
* Denotes a statistical Outlier

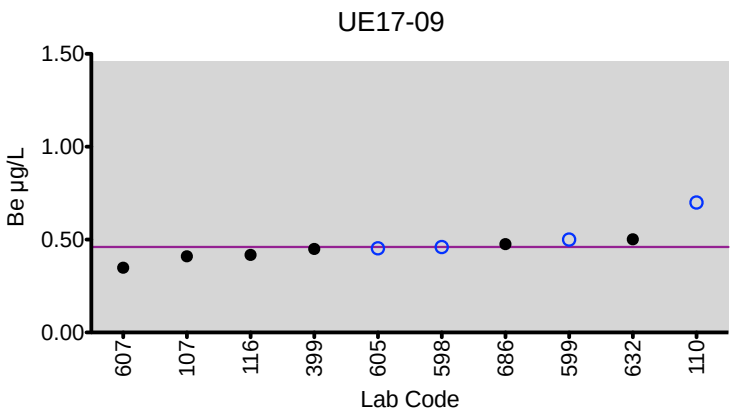
Results for Event #2, 2017:
Summary Figures

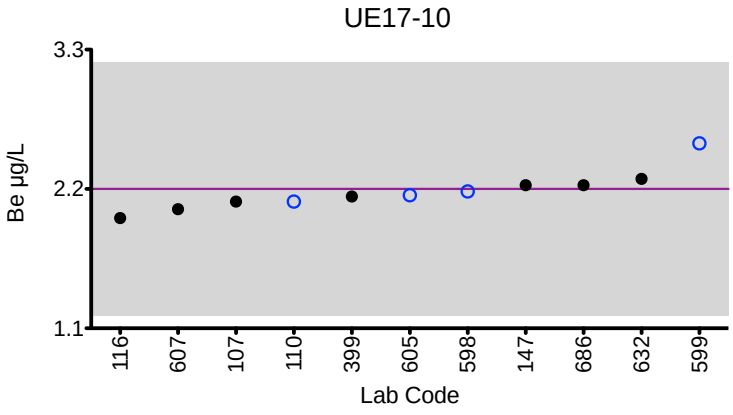
Urine Be











Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the robust mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±1 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±1 µg/L at concentrations less than or equal to 5 µg/L.

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Results for Event #2, 2017: Summary Statistics

	Urine Cd (µg/L)				
	UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Target (Robust Mean (x*))	0.52	3.80	2.51	1.13	0.94
Upper Limit	1.52	4.80	3.51	2.13	1.94
Lower Limit	0.00	2.80	1.51	0.13	0.00
Robust SD (s*)	0.04	0.11	0.15	0.07	0.10
Robust RSD (%)	7.7	2.9	6.0	6.2	10.6
Number of Sample Measurements (N)	20	21	21	21	21
Standard Uncertainty (*u*)	0.012	0.03	0.042	0.018	0.028

The acceptable range is based on quality specifications:
±1 µg/L or ±15% around the target value, whichever is greater; thus, it is fixed at ±1 µg/L at concentrations less than or equal to 6.6 µg/L. These quality specifications are based on the same criteria used by the US Centers for Disease Control Prevention (CDC) for public health labs participating in the Laboratory Response Network (LRN) PT program for Toxic Metals.

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Results for Event #2, 2017:
Performance of Participating Laboratories

		Urine Cd (µg/L)				
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
	Target	**0.52**	**3.80**	**2.51**	**1.13**	**0.94**
103	DRC/CC-ICP-MS	0.515	3.83	2.61	1.11	0.948
107	DRC/CC-ICP-MS	0.53	3.6	2.4	1.1	0.93
110	ICP-MS	0.54	3.79	2.48	1.09	0.84
116	DRC/CC-ICP-MS	0.505	3.81	2.50	1.08	0.833
147	ICP-MS	0.543	3.87	2.52	1.12	0.888
200	ICP-MS	0.67	4.05	2.70	1.35	1.46
293	DRC/CC-ICP-MS	0.58	4.18	2.71	1.35	1.03
324	ICP-MS	<1	3.86	2.55	1.20	1.08
391	DRC/CC-ICP-MS	0.43	3.53	2.30	1.01	0.84
399	DRC/CC-ICP-MS	0.517	3.79	2.51	1.14	0.926
401	DRC/CC-ICP-MS	0.5	3.8	2.5	1.2	0.9
597	ICP-MS	0.57	3.31	2.29	1.07	0.83
598	DRC/CC-ICP-MS	0.47	3.62	2.38	1.10	0.92
599	DRC/CC-ICP-MS	0.49	4.42	2.64	1.10	0.91
604	DRC/CC-ICP-MS	0.517	3.61	2.43	1.1	0.889
605	ICP-MS	0.516	3.83	2.51	1.19	0.982
606	DRC/CC-ICP-MS	0.451	3.21	2.10	0.975	0.775
607	ICP-MS	0.534	3.87	2.56	1.26	1.22
630	ICP-MS	0.506	3.75	2.45	1.16	0.980
632	DRC/CC-ICP-MS	0.432	3.87	2.67	1.16	0.993
686	ICP-MS	0.574	4.15	2.73	1.35	1.27

Based on the grading criteria for Cd in Urine, 100% of results were satisfactory, with 0 of the 21 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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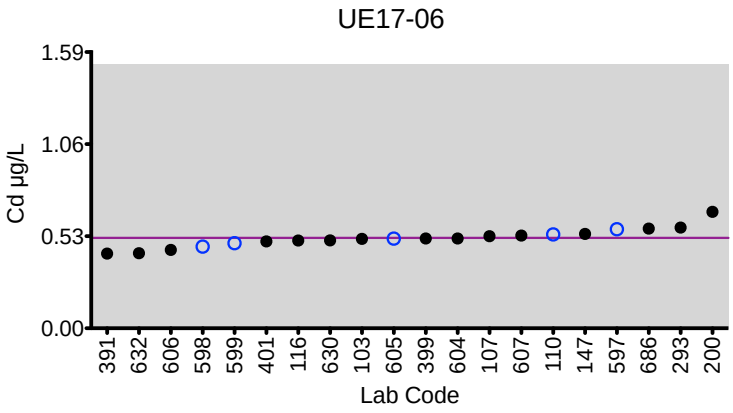
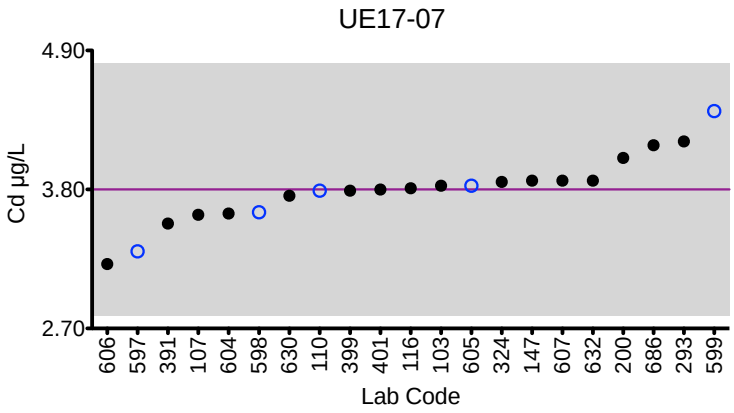
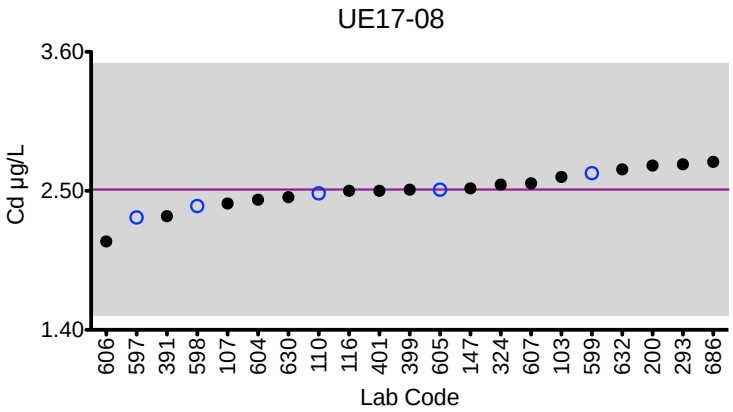
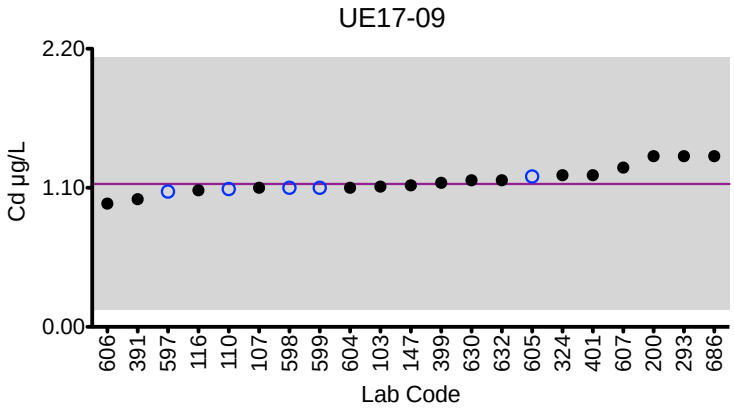
Results for Event #2, 2017: Summary Figures

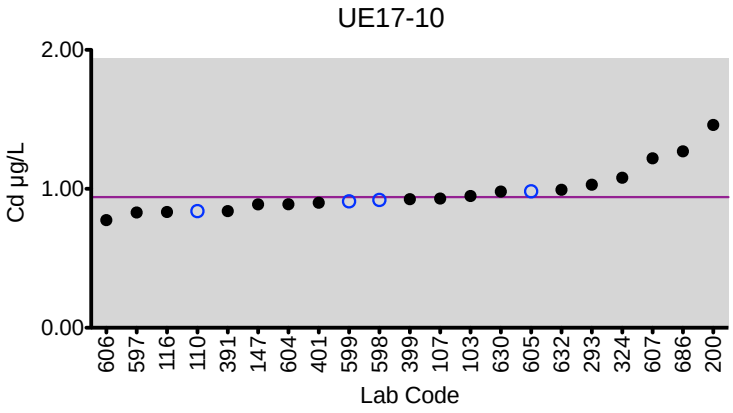
Urine Cd











Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the robust mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±1 µg/L or ±15% around the target value, whichever is greater; thus, it is fixed at ±1 µg/L at concentrations less than or equal to 6.6 µg/L.

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Results for Event #2, 2017: Summary Statistics

	Urine Co (µg/L)				
	UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Target (Robust Mean (x*))	0.49	3.2	2.3	1.4	1.9
Upper Limit	1.99	4.7	3.8	2.9	3.4
Lower Limit	0.00	1.7	0.8	0.0	0.4
Robust SD (s*)	0.03	0.1	0.1	0.1	0.1
Robust RSD (%)	6.1	3.1	4.3	7.1	5.3
Number of Sample Measurements (N)	14	15	15	15	15
Standard Uncertainty (*u*)	0.01	0.04	0.03	0.02	0.02

The acceptable range is based on quality specifications:
±1.5 µg/L or ±15% around the target value, whichever is greater; thus, it is fixed at ±1.5 µg/L at concentrations less than or equal to 10 µg/L. These quality specifications were established based on discussions with the US FDA, and represent a consensus from a network of Trace Element PT program organizers

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Results for Event #2, 2017:
Performance of Participating Laboratories

Urine Co (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
	Target	**0.49**	**3.2**	**2.3**	**1.4**	**1.9**
103	DRC/CC-ICP-MS	0.482	3.27	2.34	1.47	1.89
107	ICP-MS	0.51	3.2	2.2	1.5	2.0
110	ICP-MS	0.51	3.23	2.32	1.47	1.92
147	ICP-MS	0.459	3.16	2.23	1.34	1.83
324	ICP-MS	<1	3.15	2.30	1.47	1.87
391	DRC/CC-ICP-MS	0.50	3.02	2.2	1.39	1.82
399	DRC/CC-ICP-MS	0.472	3.22	2.35	1.45	1.86
401	DRC/CC-ICP-MS	0.5	3.3	2.4	1.4	1.8
485	HR-ICP-MS	0.462	3.09	2.22	1.41	1.81
597	ICP-MS	0.52	2.77	2.0	1.34	1.64
598	ICP-MS	0.49	3.18	2.3	1.47	1.87
599	DRC/CC-ICP-MS	0.23	2.55	1.77	1.04	1.38
605	ICP-MS	0.491	3.19	2.37	1.47	1.88
606	ICP-MS	0.454	3.07	2.25	1.46	1.85
632	ICP-MS	0.555	3.40	2.43	1.55	1.99

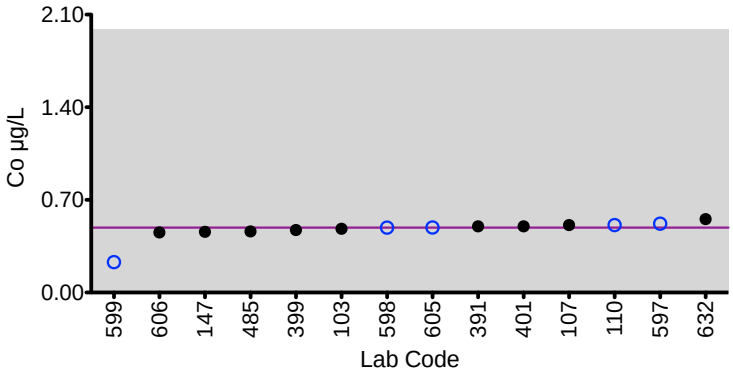
Based on the grading criteria for Co in Urine, 100% of results were satisfactory, with 0 of the 15 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

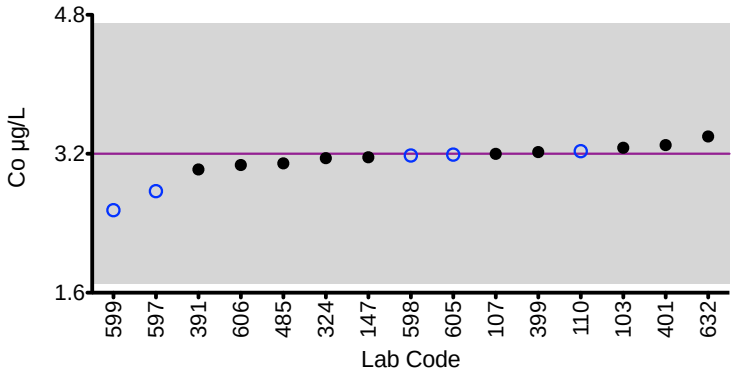
Results for Event #2, 2017:
Summary Figures

Urine Co

UE17-06



UE17-07



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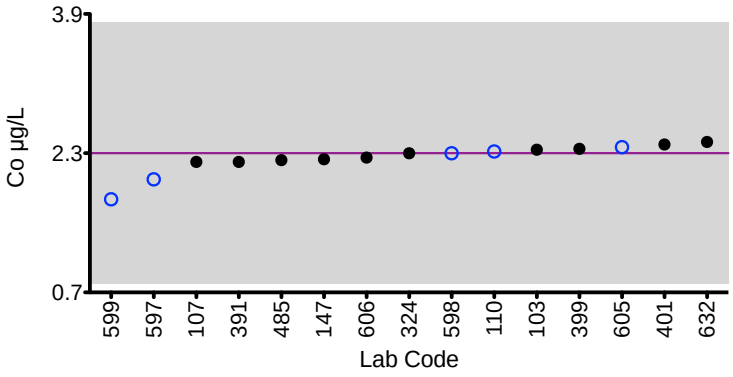
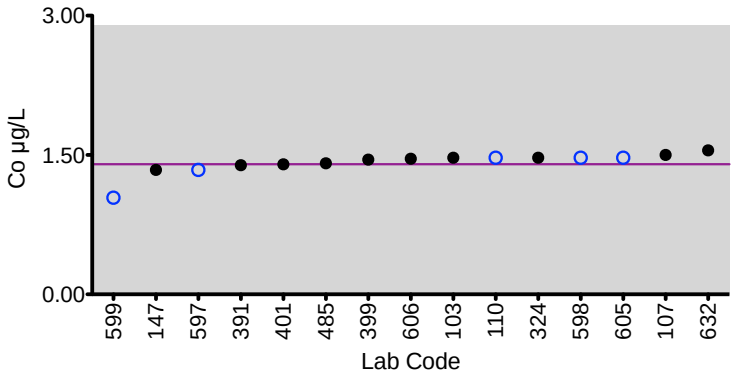
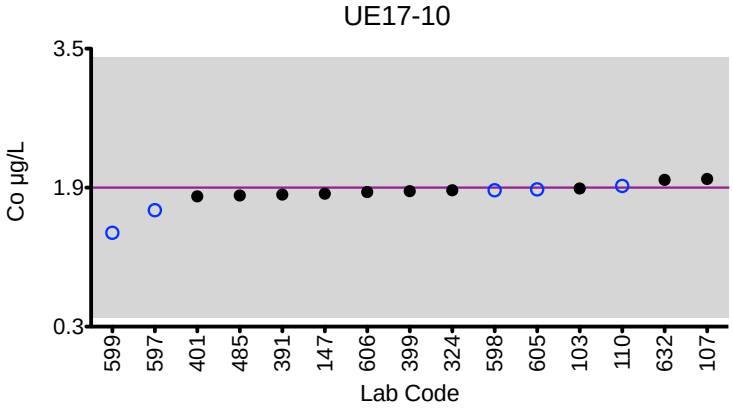


UE17-09



UE17-10



Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the robust mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±1.5 µg/L or ±15% around the target value, whichever is greater; thus, it is fixed at ±1.5 µg/L at concentrations less than or equal to 10 µg/L.

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Results for Event #2, 2017: Summary Statistics

	Urine Cr (µg/L)				
	UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Target (Robust Mean (x*))	0.85	11.5	3.3	4.7	7.3
Upper Limit	3.85	14.5	6.3	7.7	10.3
Lower Limit	0.00	8.5	0.3	1.7	4.3
Robust SD (s*)	0.06	0.7	0.1	0.2	0.3
Robust RSD (%)	7.1	6.1	3.0	4.3	4.1
Number of Sample Measurements (N)	12	12	12	12	12
Standard Uncertainty (*u*)	0.02	0.25	0.03	0.07	0.11

The acceptable range is based on quality specifications:
±3 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±3 µg/L at concentrations less than or equal to 15 µg/L. These quality specifications were established based on discussions with the US FDA, and represent a consensus from a network of Trace Element PT program organizers

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Results for Event #2, 2017:
Performance of Participating Laboratories

		Urine Cr (µg/L)				
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
	Target	**0.85**	**11.5**	**3.3**	**4.7**	**7.3**
103	DRC/CC-ICP-MS	0.826	12.1	3.44	4.78	7.65
107	ICP-MS	0.83	12	3.2	4.7	7.4
110	DRC/CC-ICP-MS	1.0	11.6	3.6	4.8	7.7
116	DRC/CC-ICP-MS	0.872	12.1	3.57	4.94	7.79
147	DRC/CC-ICP-MS	0.702	10.3	3.13	4.16	6.92
324	ICP-MS	1.00	11.00	3.36	4.69	7.04
391	DRC/CC-ICP-MS	1.19	12.15	3.17	5.22	7.10
401	DRC/CC-ICP-MS	0.8	11.7	3.4	4.6	7.3
485	HR-ICP-MS	0.822	11.50	3.22	4.56	7.30
598	DRC/CC-ICP-MS	0.83	11.1	3.19	4.51	7.10
599	DRC/CC-ICP-MS	1.08	10.1	3.20	4.31	6.62
632	DRC/CC-ICP-MS	0.819	11.3	3.20	4.66	7.19

Based on the grading criteria for Cr in Urine, 100% of results were satisfactory, with 0 of the 12 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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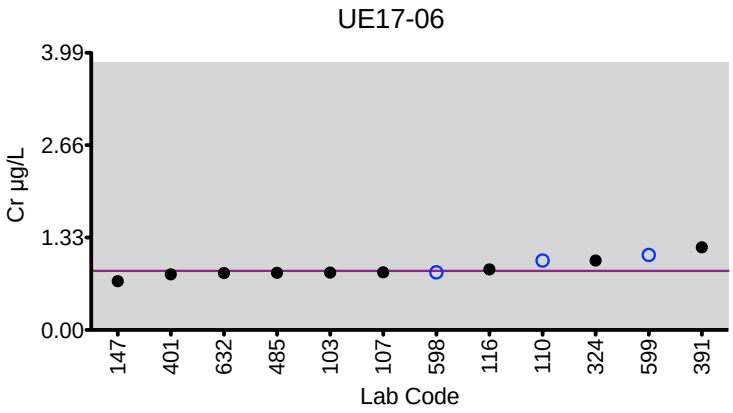
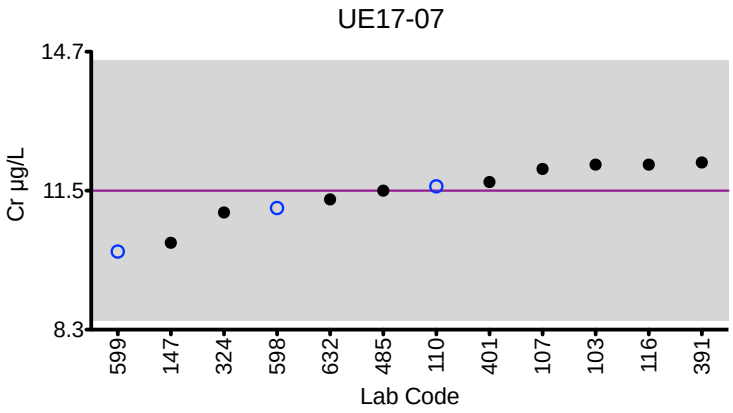
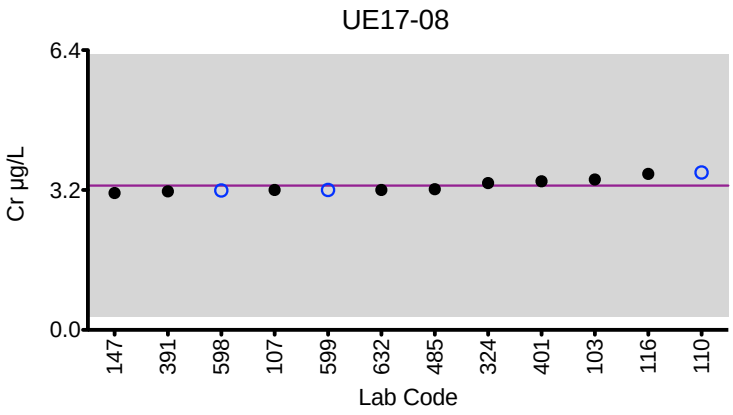
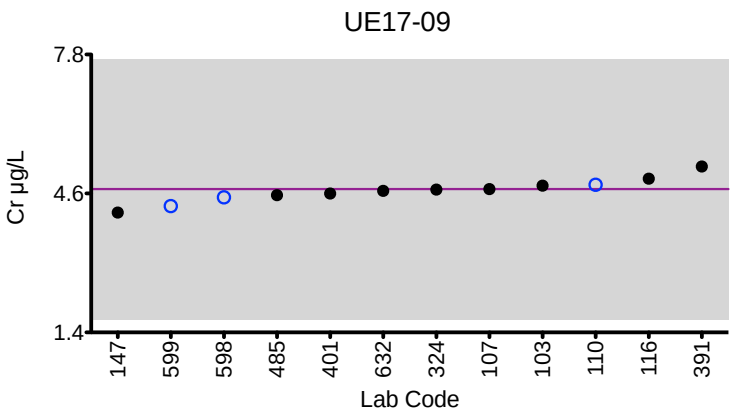
Results for Event #2, 2017: Summary Figures

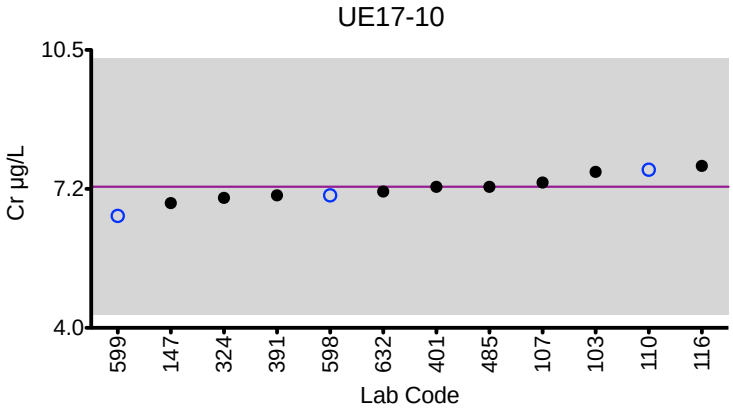
Urine Cr











Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the robust mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±3 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±3 µg/L at concentrations less than or equal to 15 µg/L.

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Results for Event #2, 2017: Summary Statistics

	Urine Hg (µg/L)				
	UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Target (Robust Mean (x*))	3.0	9.6	30.6	63.0	14.5
Upper Limit	6.0	12.6	39.8	81.9	18.9
Lower Limit	0.0	6.6	21.4	44.1	10.2
Robust SD (s*)	0.3	0.7	2.3	7.3	1.2
Robust RSD (%)	10.0	7.3	7.5	11.6	8.3
Number of Sample Measurements (N)	12	13	13	11	13
Standard Uncertainty (*u*)	0.11	0.25	0.8	2.75	0.42

The acceptable range is based on quality specifications:
±3 µg/L or ±30% around the target value, whichever is greater; thus, it is fixed at ±3 µg/L at concentrations less than or equal to 10 µg/L. These quality specifications were established by New York State Department of Health's Wadsworth Center, the PT Program organizer.

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Results for Event #2, 2017:
Performance of Participating Laboratories

		Urine Hg (µg/L)				
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
	Target	**3.0**	**9.6**	**30.6**	**63.0**	**14.5**
103	DRC/CC-ICP-MS	2.84	9.12	29.1	57.9	13.2
107	DRC/CC-ICP-MS	3.3	10	32	64	16
110	ICP-MS	2.90	9.45	28.3	59.0	13.7
147	CV-AAS	2.78	9.54	29.3	60.6	14.2
293	DRC/CC-ICP-MS	2.67	9.50	30.5	63.61	14.47
391	DRC/CC-ICP-MS	3.10	10.05	31.09	64.73	15.17
401	DRC/CC-ICP-MS	5	13 ↑	39	75	19 ↑
598	ICP-MS	2.64	8.33	26.2	53.1	12.4
599	DRC/CC-ICP-MS	<5	7.12	40.9 ↑	83.6 ↑	14.8
604	DRC/CC-ICP-MS	3.34	9.87	30.7	64.1	14.5
605	ICP-MS	3.16	9.91	31.8	>40	15.1
606	ICP-MS	3.15	10.4	31.5	>50	15.3
684	DRC/CC-ICP-MS	3.06	9.03	28.0	57.5	13.5

Based on the grading criteria for Hg in Urine, 94% of results were satisfactory, with 2 of the 13 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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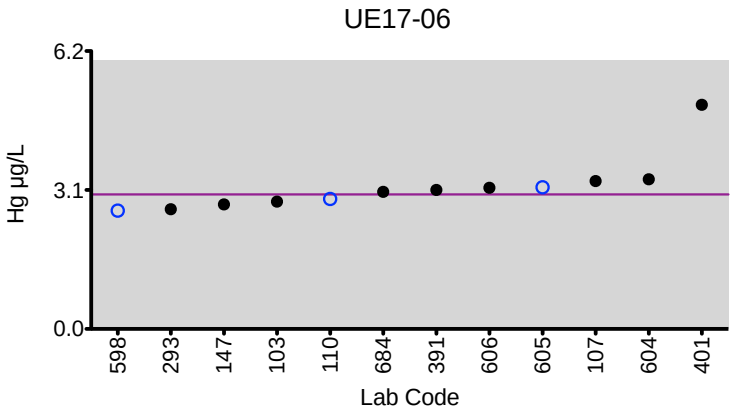
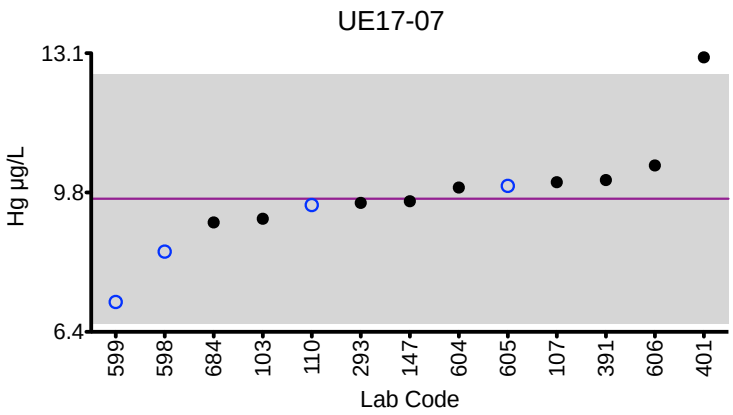
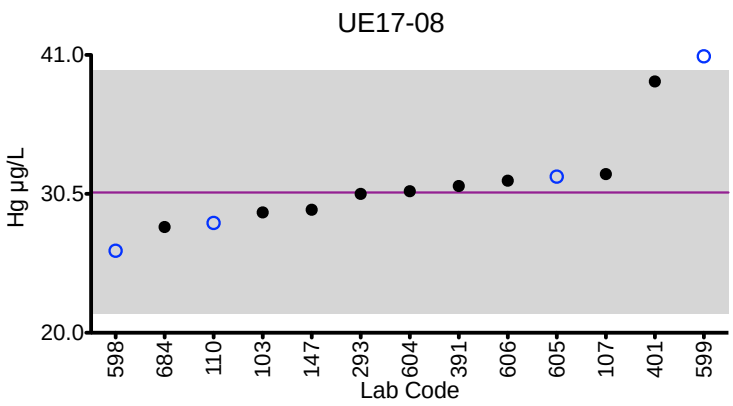
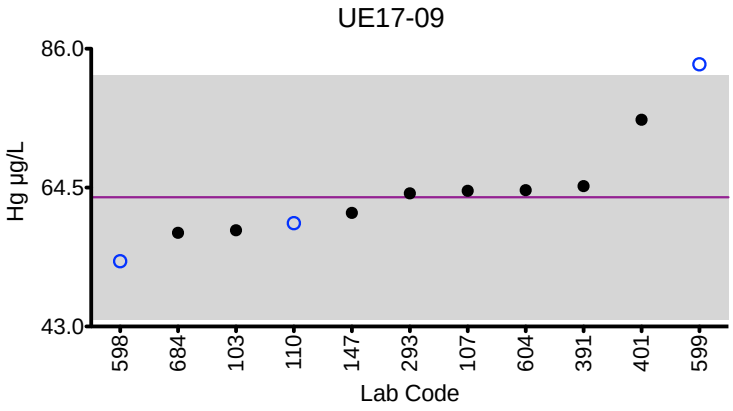
Results for Event #2, 2017: Summary Figures

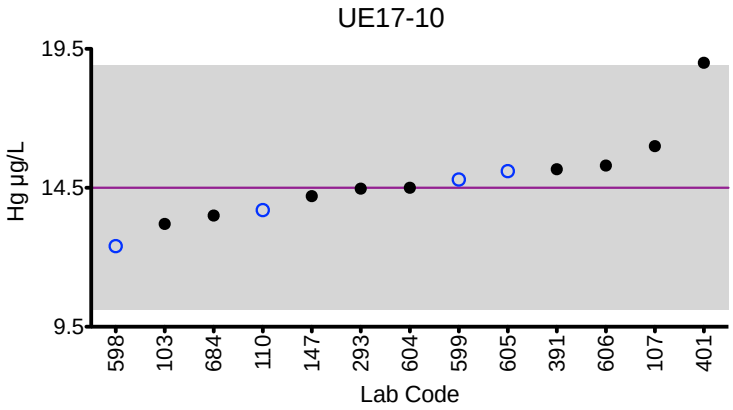
Urine Hg











Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the robust mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±3 µg/L or ±30% around the target value, whichever is greater; thus, it is fixed at ±3 µg/L at concentrations less than or equal to 10 µg/L.

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Results for Event #2, 2017: Summary Statistics

	Urine Mn (µg/L)				
	UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Target (Robust Mean (x*))	0.66	9.6	3.0	4.8	1.8
Upper Limit	1.21	12.0	3.8	6.0	2.4
Lower Limit	0.11	7.2	2.2	3.6	1.2
Robust SD (s*)	0.15	0.5	0.2	0.2	0.2
Robust RSD (%)	22.7	5.2	6.7	4.2	11.1
Number of Sample Measurements (N)	16	17	17	17	17
Standard Uncertainty (*u*)	0.048	0.160	0.054	0.073	0.052

The acceptable range is based on quality specifications:
±0.55 µg/L or ±25% around the target value, whichever is greater; thus, it is fixed at ±0.55 µg/L at concentrations less than or equal to 2.2 µg/L. Quality specifications for Mn are consistent with those used by other External Quality Assessment Schemes for trace elements. (Praamsma M, et al. Clinical Chemistry and Laboratory Medicine.2016; 54(12): 1921-1928)

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Results for Event #2, 2017:
Performance of Participating Laboratories

		Urine Mn (µg/L)				
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
	Target	**0.66**	**9.6**	**3.0**	**4.8**	**1.8**
103	DRC/CC-ICP-MS	0.647	9.89	3.05	4.93	1.85
107	DRC/CC-ICP-MS	0.66	9.6	3.0	4.1	1.9
110	DRC/CC-ICP-MS	0.7	9.6	3.0	4.9	1.7
116	DRC/CC-ICP-MS	0.245	9.66	2.80	5.03	1.73
147	DRC/CC-ICP-MS	0.521	9.29	2.78	4.70	1.62
324	ICP-MS	<1	9.20	2.95	4.75	1.75
391	DRC/CC-ICP-MS	0.76	10.16	3.10	4.62	1.73
399	DRC/CC-ICP-MS	0.714	9.74	3.17	4.99	1.90
597	ICP-MS	1.35 ↑	8.93	3.17	4.87	2.02
598	ICP-MS	0.72	9.60	3.07	4.86	1.93
599	DRC/CC-ICP-MS	0.66	9.41	2.90	4.65	1.94
604	DRC/CC-ICP-MS	0.581	8.66	2.67	4.33	1.62
605	ICP-MS	0.63	9.55	3.09	4.84	1.84
606	DRC/CC-ICP-MS	0.491	8.78	2.65	4.35	1.58
630	ICP-MS	1.05	10.4	3.68	5.64	2.72 ↑
632	DRC/CC-ICP-MS	1.03	10.5	3.40	5.25	1.97
684	ICP-MS	0.104 ↓	10.2	2.92	4.85	1.62

Based on the grading criteria for Mn in Urine, 96% of results were satisfactory, with 0 of the 17 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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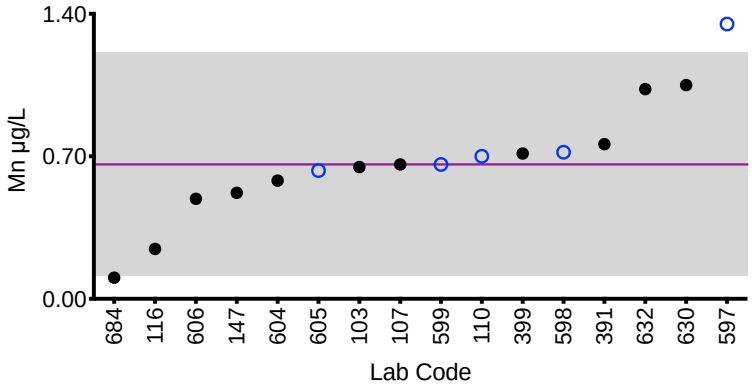
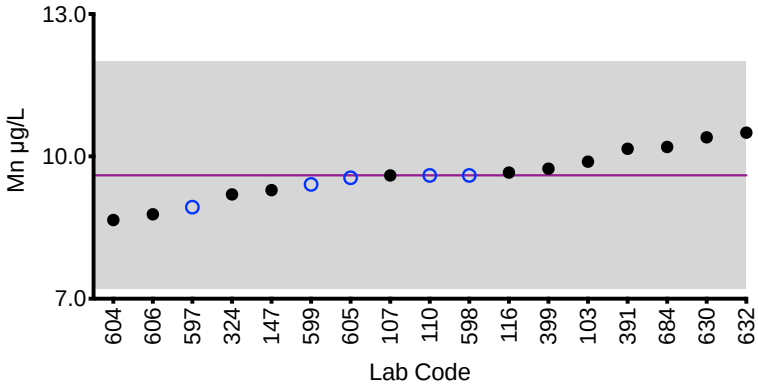
Results for Event #2, 2017: Summary Figures

Urine Mn

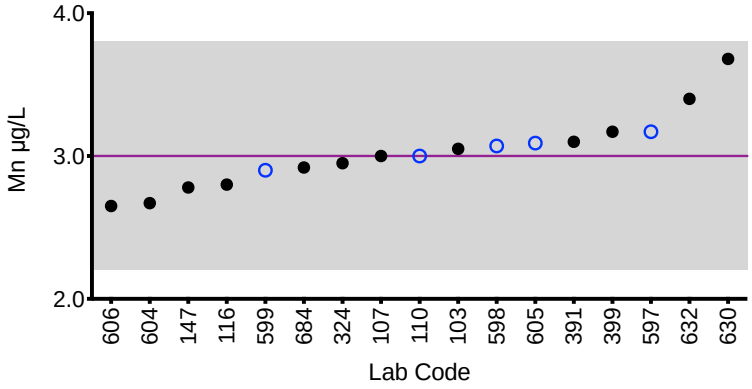
UE17-06



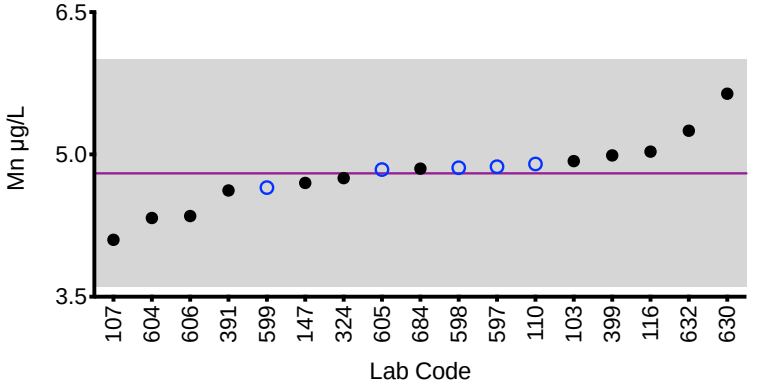
UE17-07



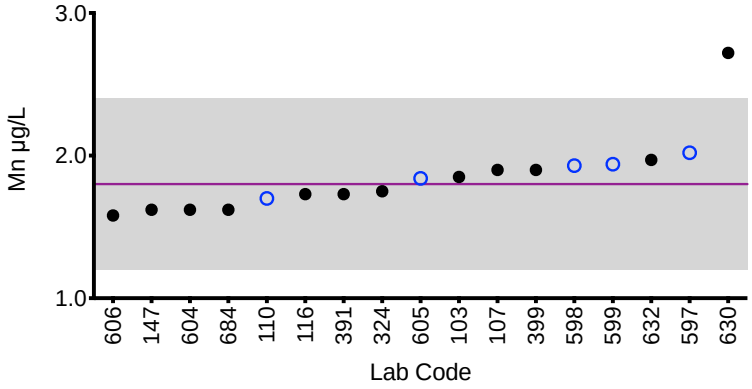
UE17-08



UE17-09



UE17-10



Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the robust mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±0.55 µg/L or ±25% around the target value, whichever is greater; thus, it is fixed at ±0.55 µg/L at concentrations less than or equal to 2.2 µg/L.

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Results for Event #2, 2017: Summary Statistics

	Urine Pb (µg/L)				
	UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Target (Robust Mean (x*))	0.7	6.0	3.1	9.7	4.5
Upper Limit	1.7	7.2	4.1	11.6	5.5
Lower Limit	0.0	4.8	2.1	7.8	3.5
Robust SD (s*)	0.1	0.2	0.1	0.4	0.2
Robust RSD (%)	14.3	3.3	3.2	4.1	4.4
Number of Sample Measurements (N)	14	17	17	17	17
Standard Uncertainty (*u*)	0.033	0.050	0.045	0.109	0.055

The acceptable range is based on quality specifications:
±1 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±1 µg/L at concentrations less than or equal to 5 µg/L. These quality specifications are based on the same criteria used by the US Centers for Disease Control Prevention (CDC) for public health labs participating in the Laboratory Response Network (LRN) PT program for Toxic Metals.

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Results for Event #2, 2017:
Performance of Participating Laboratories

		Urine Pb (µg/L)				
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
	Target	**0.7**	**6.0**	**3.1**	**9.7**	**4.5**
103	DRC/CC-ICP-MS	0.638	6.08	3.17	9.88	4.53
107	ICP-MS	0.67	6.0	3.1	9.6	4.6
110	ICP-MS	< 0.7	5.9	3.2	9.9	4.4
116	ICP-MS	0.568	5.94	3.14	9.62	4.43
147	ICP-MS	0.564	5.91	3.03	9.76	4.39
293	DRC/CC-ICP-MS	0.56	6.28	3.27	10.32	4.72
324	ICP-MS	<1	5.63	2.99	9.23	4.20
391	DRC/CC-ICP-MS	<0.000	5.2	2.0 ↓	9.0	3.4 ↓
399	ICP-MS	0.682	5.99	3.17	9.93	4.51
597	ICP-MS	1.6	6.1	3.6	9.4	4.7
598	ICP-MS	0.57	5.12	2.73	8.38	3.80
599	DRC/CC-ICP-MS	0.88	6.00	3.16	9.69	4.47
605	ICP-MS	0.624	6.0	3.13	9.73	4.52
606	ICP-MS	0.627	5.67	3.00	9.27	4.17
607	ICP-MS	0.731	6.32	3.31	10.4	4.72
632	ICP-MS	0.734	5.90	3.12	9.73	4.51
686	ICP-MS	0.695	6.08	3.26	10.3	4.62

Based on the grading criteria for Pb in Urine, 98% of results were satisfactory, with 1 of the 17 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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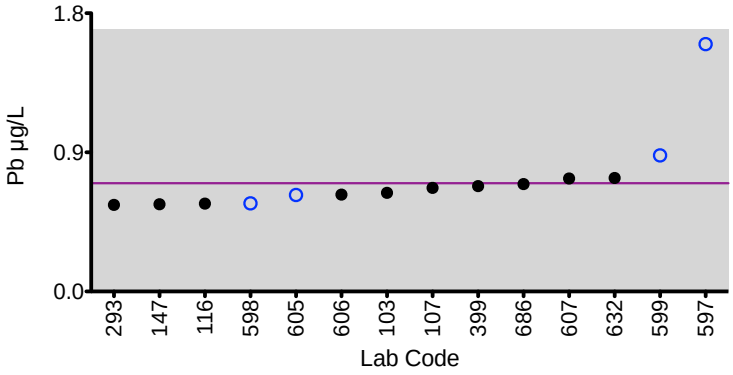
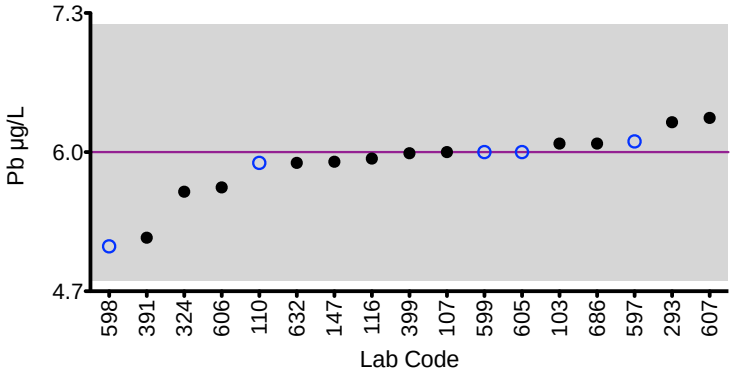
Results for Event #2, 2017: Summary Figures

Urine Pb

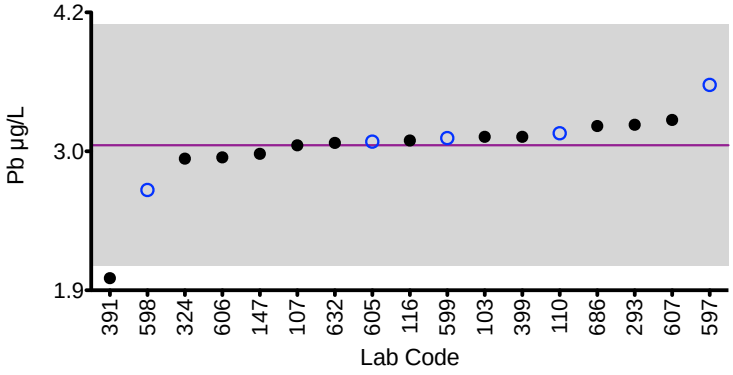
UE17-06



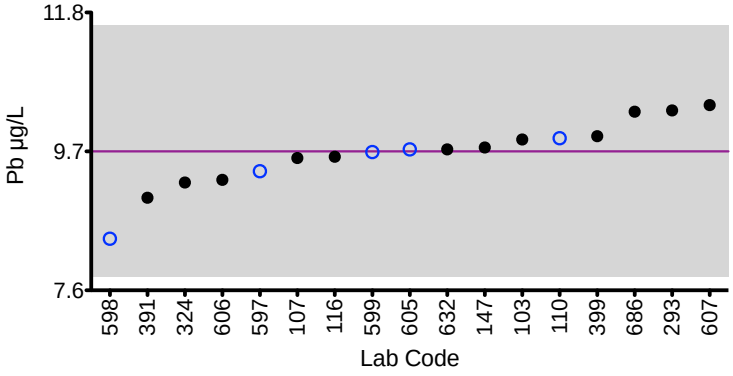
UE17-07



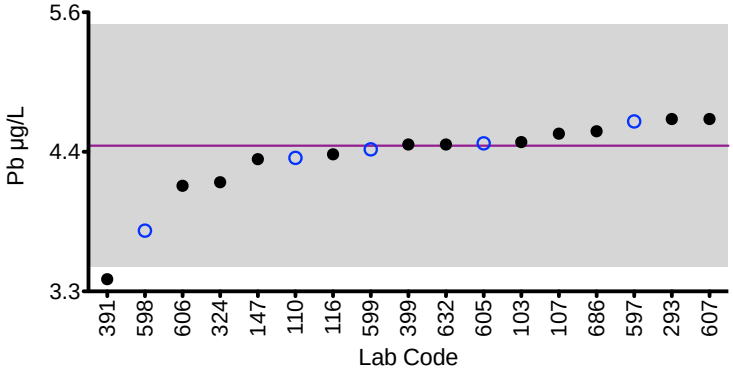
UE17-08



UE17-09



UE17-10



Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the robust mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±1 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±1 µg/L at concentrations less than or equal to 5 µg/L.

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Results for Event #2, 2017: Summary Statistics

Urine Tl (µg/L)					
	UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Target (Robust Mean (x*))	0.28	0.72	1.25	4.81	0.21
Upper Limit	0.48	0.92	1.50	5.77	0.41
Lower Limit	0.08	0.52	1.00	3.85	0.01
Robust SD (s*)	0.01	0.02	0.05	0.15	0.02
Robust RSD (%)	3.6	2.8	4.0	3.1	9.5
Number of Sample Measurements (N)	13	13	13	13	13
Standard Uncertainty (*u*)	<0.01	0.01	0.02	0.05	0.01

The acceptable range is based on quality specifications:
±0.2 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±0.2 µg/L at concentrations less than or equal to 1 µg/L. These quality specifications are based on the same criteria used by the US Centers for Disease Control Prevention (CDC) for public health labs participating in the Laboratory Response Network (LRN) PT program for Toxic Metals.

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Results for Event #2, 2017:
Performance of Participating Laboratories

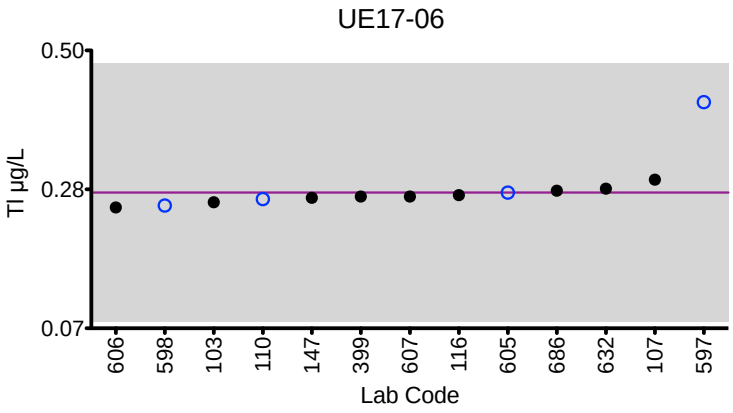
		Urine Tl (µg/L)				
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
	Target	**0.28**	**0.72**	**1.25**	**4.81**	**0.21**
103	DRC/CC-ICP-MS	0.265	0.729	1.25	4.73	0.209
107	ICP-MS	0.30	0.70	1.2	5.1	0.23
110	ICP-MS	0.27	0.72	1.27	4.84	0.21
116	ICP-MS	0.276	0.726	1.29	4.74	0.202
147	ICP-MS	0.272	0.734	1.24	4.82	0.200
399	ICP-MS	0.274	0.719	1.23	4.94	0.221
597	ICP-MS	0.42	0.77	1.14	4.32	0.28
598	ICP-MS	0.26	0.65	1.14	4.35	0.18
605	ICP-MS	0.28	0.713	1.29	4.82	0.206
606	ICP-MS	0.257	0.687	1.22	4.56	0.198
607	ICP-MS	0.274	0.731	1.28	4.88	0.216
632	ICP-MS	0.286	0.758	1.31	4.97	0.223
686	ICP-MS	0.283	0.721	1.26	4.86	0.225

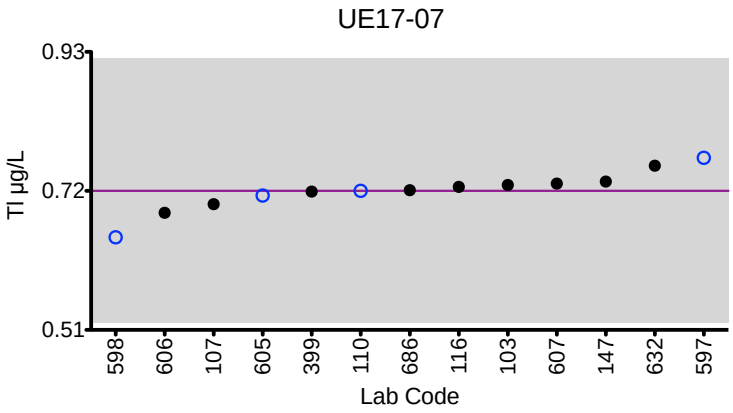
Based on the grading criteria for Tl in Urine, 100% of results were satisfactory, with 0 of the 13 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

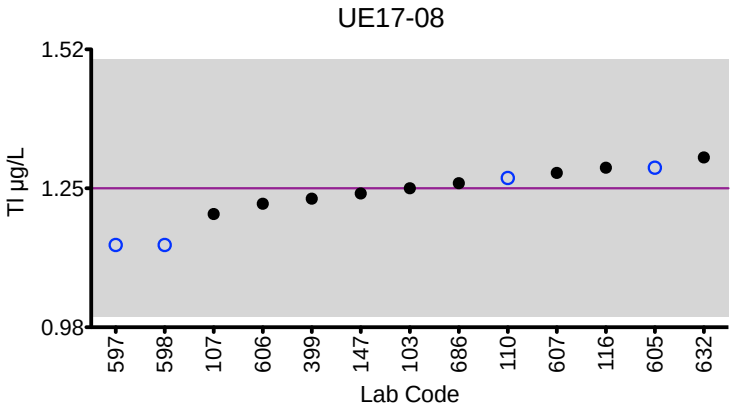
* Denotes a statistical Outlier

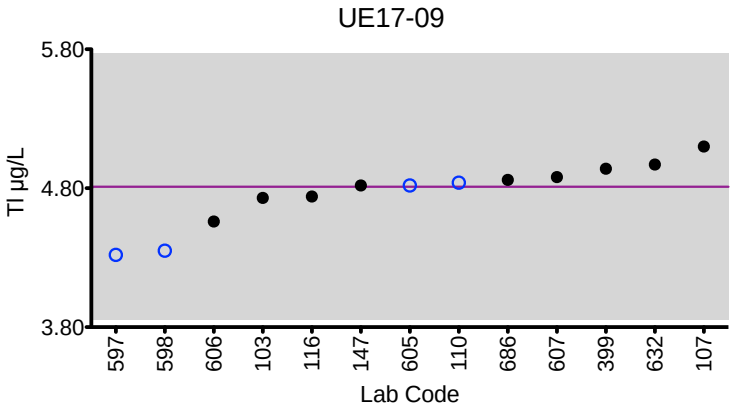
Results for Event #2, 2017:
Summary Figures

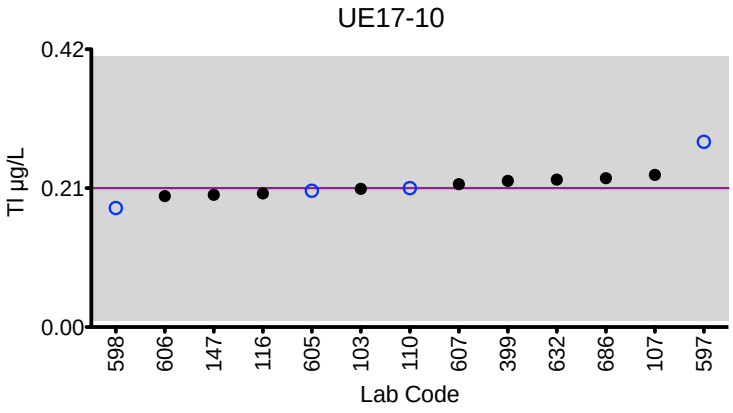
Urine Tl











Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the robust mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±0.2 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±0.2 µg/L at concentrations less than or equal to 1 µg/L.

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Results for Event #2, 2017: Summary Statistics

	Urine U (µg/L)				
	UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Target (Robust Mean (x*))	0.030	0.054	0.150	0.186	0.014
Upper Limit	0.060	0.084	0.180	0.223	0.044
Lower Limit	0.000	0.024	0.120	0.149	0.000
Robust SD (s*)	0.003	0.005	0.009	0.007	0.002
Robust RSD (%)	10.0	9.3	6.0	3.8	14.3
Number of Sample Measurements (N)	15	16	17	17	15
Standard Uncertainty (*u*)	0.0011	0.0014	0.0027	0.0021	0.0006

The acceptable range is based on quality specifications:
±0.03 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±0.03 µg/L at concentrations less than or equal to 0.15 µg/L. These quality specifications are based on the same criteria used by the US Centers for Disease Control Prevention (CDC) for public health labs participating in the Laboratory Response Network (LRN) PT program for Toxic Metals.

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Results for Event #2, 2017:
Performance of Participating Laboratories

Urine U (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
	Target	**0.030**	**0.054**	**0.150**	**0.186**	**0.014**
103	DRC/CC-ICP-MS	0.0319	0.0577	0.143	0.182	0.0142
107	ICP-MS	0.036	0.061	0.17	0.20	0.016
110	ICP-MS	0.029	0.045	0.157	0.192	0.014
116	ICP-MS	*0.301 ↑	0.0564	0.150	0.183	0.0137
147	ICP-MS	0.0267	0.0505	0.151	0.182	0.0155
324	ICP-MS	0.038	0.068	0.185 ↑	0.230 ↑	0.017
399	ICP-MS	0.029	0.0501	0.139	0.187	0.017
598	ICP-MS	0.034	0.050	0.138	0.170	0.015
599	DRC/CC-ICP-MS	<0.1	<0.1	0.12	0.15	<0.1
604	ICP-MS	0.029	0.055	0.152	0.185	0.013
605	ICP-MS	0.030	0.051	0.150	0.182	0.014
606	ICP-MS	0.025	0.052	0.144	0.181	0.011
607	ICP-MS	0.027	0.055	0.154	0.192	0.011
630	ICP-MS	0.0300	0.0557	0.152	0.188	0.013
632	ICP-MS	0.0317	0.0549	0.156	0.191	<0.015
684	ICP-MS	0.0220	0.0500	0.144	0.182	0.008
686	ICP-MS	0.0304	0.0573	0.153	0.198	0.0150

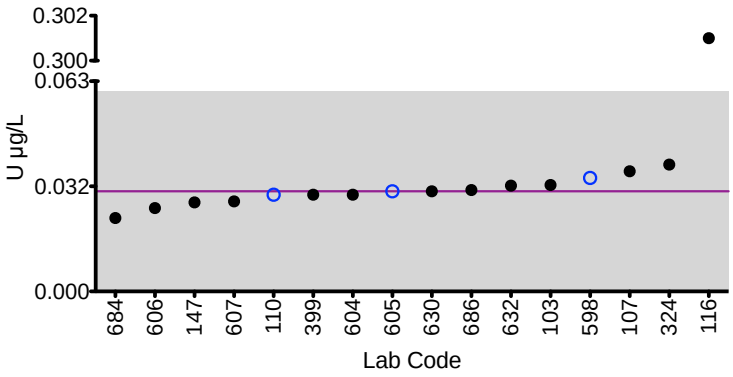
Based on the grading criteria for U in Urine, 96% of results were satisfactory, with 1 of the 17 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

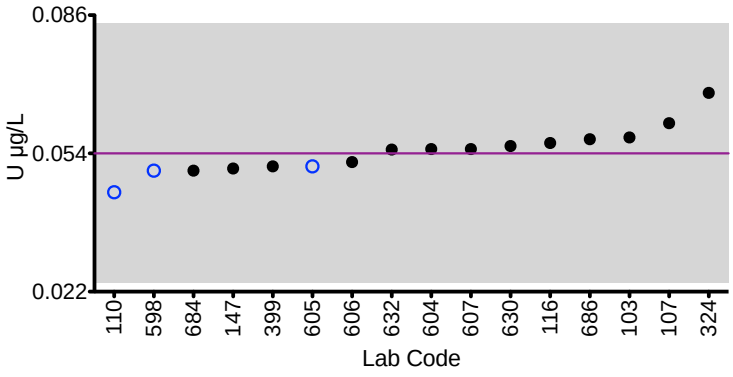
Results for Event #2, 2017:
Summary Figures

Urine U

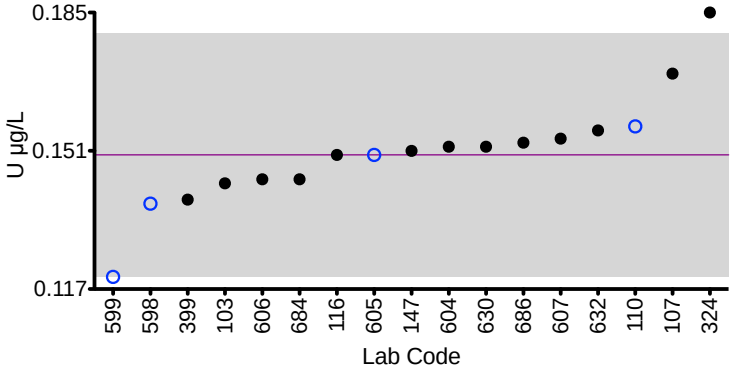
UE17-06



UE17-07



UE17-08



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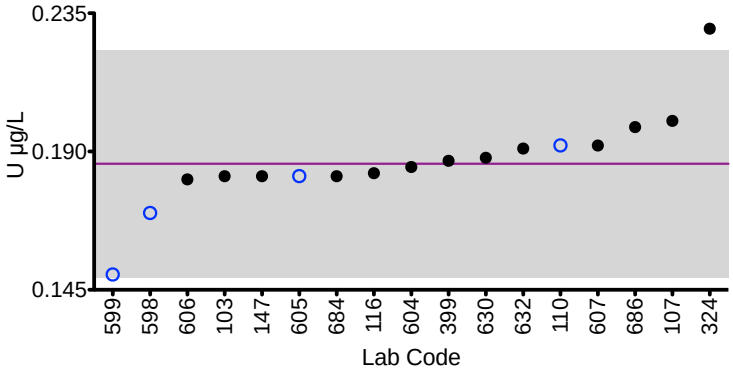
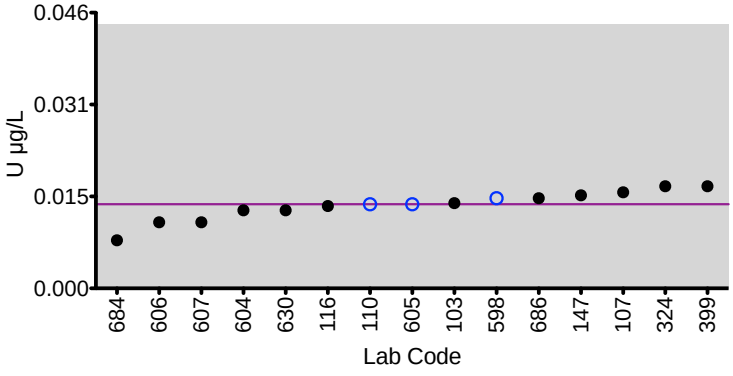


UE17-10



Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the robust mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±0.03 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±0.03 µg/L at concentrations less than or equal to 0.15 µg/L.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Urine Cs (µg/L)

Lab Code	Method	UE17-06	UE17-07	UE17-08	UE17-09	UE17-10
107	ICP-MS	1.9	11	6.6	3.6	11
110	ICP-MS	2.0	12.2	7.5	4.1	11.4
147	ICP-MS	1.90	11.2	6.87	3.69	10.3
399	ICP-MS	1.99	11.8	7.33	3.93	11.1
597	ICP-MS	1.69	9.80	5.98	3.41	8.92
598	ICP-MS	1.97	11.7	7.13	3.89	10.6
599	DRC/CC-ICP-MS	2.03	13.1	7.92	4.24	12.1
605	ICP-MS	1.91	11.3	7.06	3.72	10.7
606	ICP-MS	1.92	12.1	7.40	4.02	11.4
632	ICP-MS	2.07	12.4	7.72	4.11	11.7

Summary Statistics

	UE17-06	UE17-07	UE17-08	UE17-09	UE17-10
Robust Mean (x*)	2.0	11.7	7.2	3.9	11.0
Robust SD (s*)	0.1	0.8	0.5	0.3	0.7
Robust RSD (%)	5.0	6.8	6.9	7.7	6.4
Number of Sample Measurements (N)	10	10	10	10	10
Standard Uncertainty (*u*)	0.03	0.31	0.20	0.11	0.26

*Denotes a statistical Outlier.

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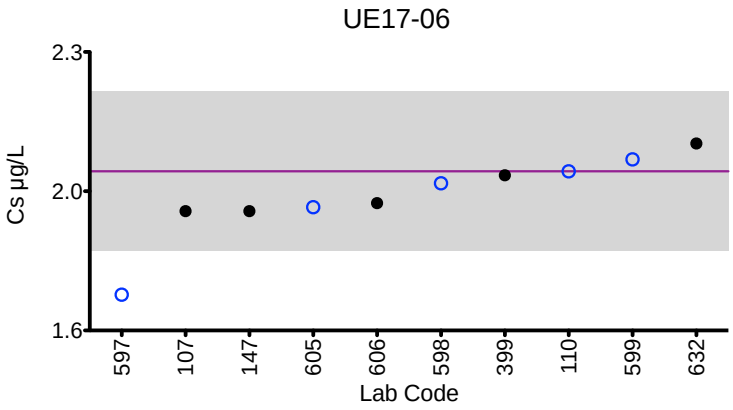
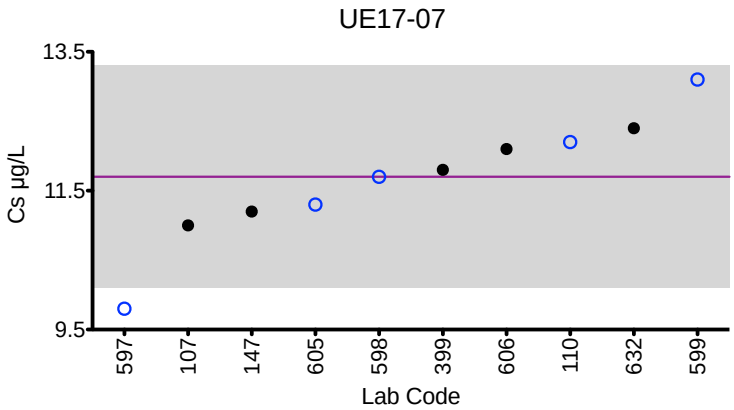
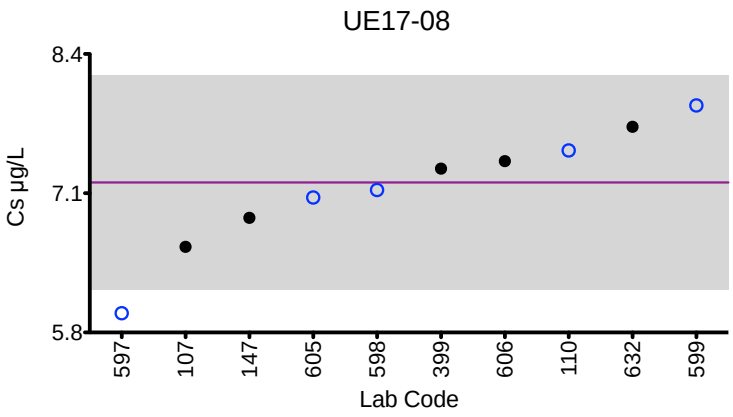
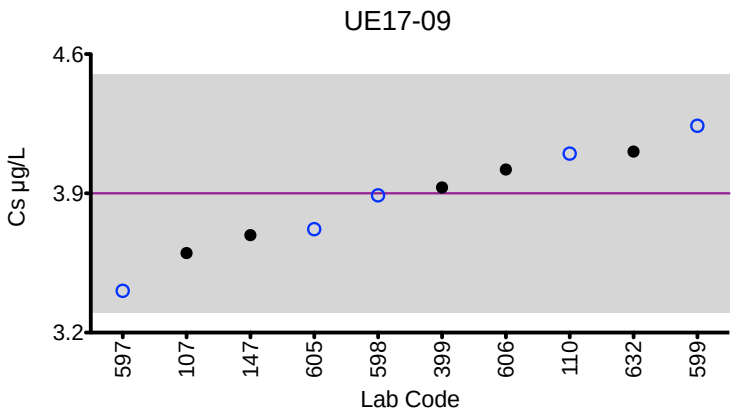
Results for Event #2, 2017: Summary Figures

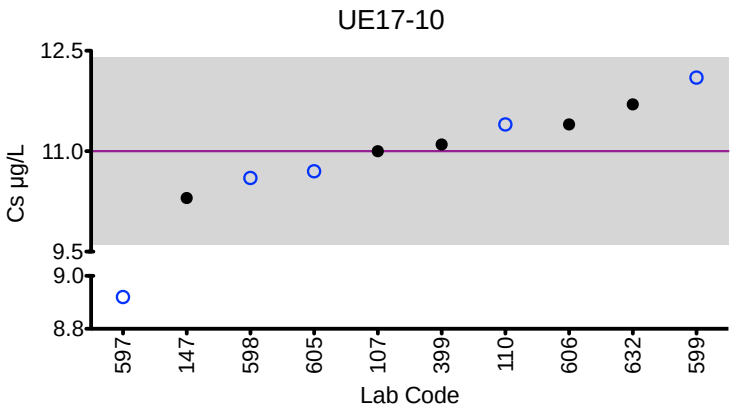
Urine Cs











Legend:
o C/HHEAR Labs ● Other Labs
Horizontal purple line = robust mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Urine Cu (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
110	ICP-MS	28.0	18.7	129	48.7	63.4
116	DRC/CC-ICP-MS	14.7	6.27	115	45.9	50.0
147	ICP-MS	26.6	18.3	125	46.4	60.5
324	ICP-MS	25.56	17.07	122.39	45.93	60.12
391	DRC/CC-ICP-MS	27.9	18.0	130.4	48.4	62.3
401	DRC/CC-ICP-MS	27	16	118	44	58
597	ICP-MS	20.9	14.0	100.9	39.9	49.7
598	ICP-MS	22.8	15.7	110	41.4	53.6
599	DRC/CC-ICP-MS	21.9	13.3	126.6	42.9	60.3
632	ICP-MS	34.0	26.8	137	55.4	72.3

Summary Statistics					
	UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Robust Mean (x*)	25.2	16.4	122	45.5	59.3
Robust SD (s*)	4.1	3.1	10	4.0	4.7
Robust RSD (%)	16.3	18.9	8.2	8.8	7.9
Number of Sample Measurements (N)	10	10	10	10	10
Standard Uncertainty (*u*)	1.62	1.22	4.03	1.58	1.87

*Denotes a statistical Outlier.

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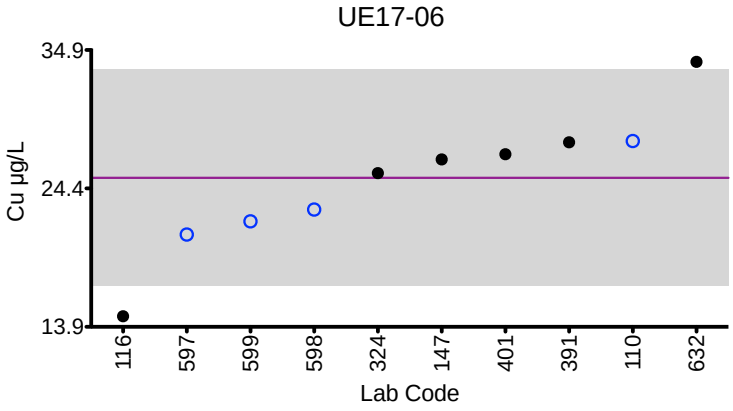
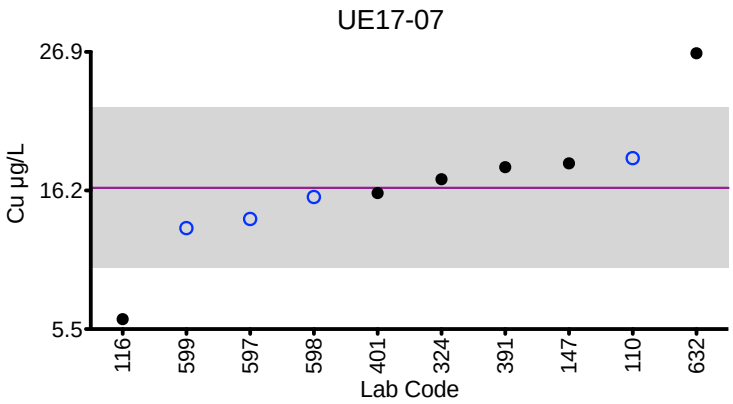
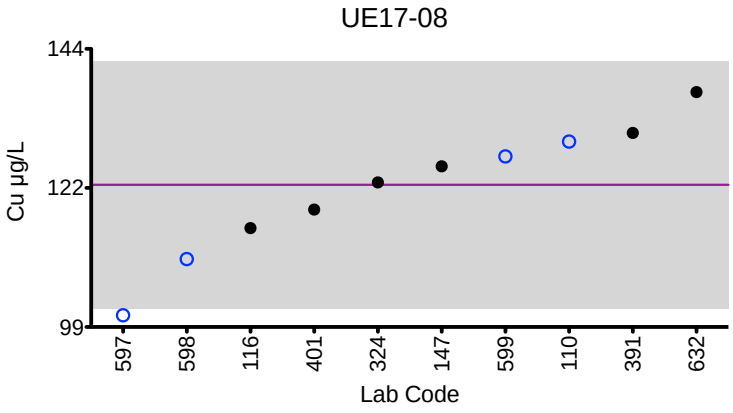
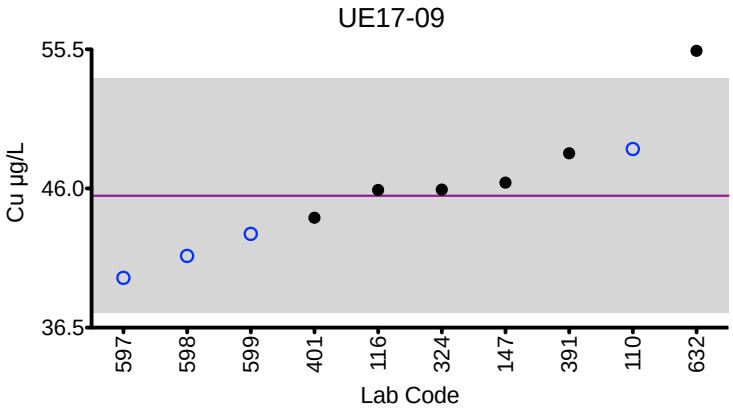
Results for Event #2, 2017: Summary Figures

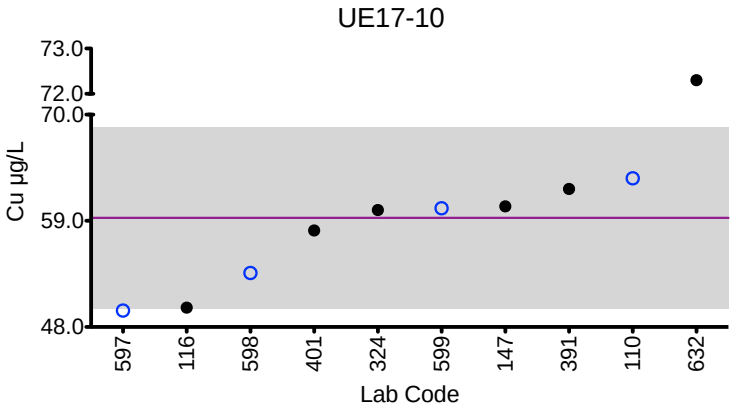
Urine Cu











Legend:
o C/HHEAR Labs ● Other Labs
Horizontal purple line = robust mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Urine Mo (µg/L)

Lab Code	Method	UE17-06	UE17-07	UE17-08	UE17-09	UE17-10
103	DRC/CC-ICP-MS	24.1	151	98.7	77.8	179
107	ICP-MS	24	140	93	73	180
110	ICP-MS	24.9	155	103	79.1	182
147	ICP-MS	22.9	139	92.8	71.9	162
324	ICP-MS	22.92	138.56	92.19	71.52	165.25
399	ICP-MS	25.0	153	98.7	79.3	181
485	HR-ICP-MS	24.5	148	99.3	77.3	180
597	ICP-MS	19.67	125.1	79.89	66.51	146.52
598	DRC/CC-ICP-MS	24.8	154	104	81.2	183
599	DRC/CC-ICP-MS	24.6	164.5	106.3	82.2	191.4
605	ICP-MS	22.8	141.0	93.2	72.8	166
606	ICP-MS	24.6	156	102	79.9	184
632	ICP-MS	27.0	166	111	86.4	199

Summary Statistics

	UE17-06	UE17-07	UE17-08	UE17-09	UE17-10
Robust Mean (x*)	24.3	149	98.5	76.9	179
Robust SD (s*)	0.8	12	7.3	5.6	7
Robust RSD (%)	3.3	8.1	7.4	7.3	3.9
Number of Sample Measurements (N)	13	13	13	13	13
Standard Uncertainty (*u*)	0.28	4.15	2.53	1.96	2.54

*Denotes a statistical Outlier.

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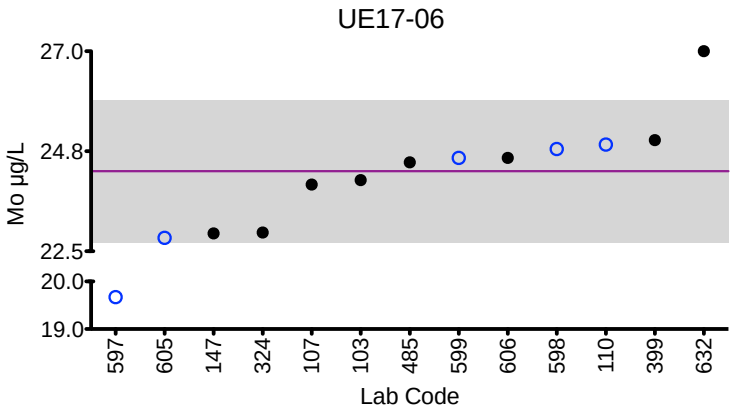
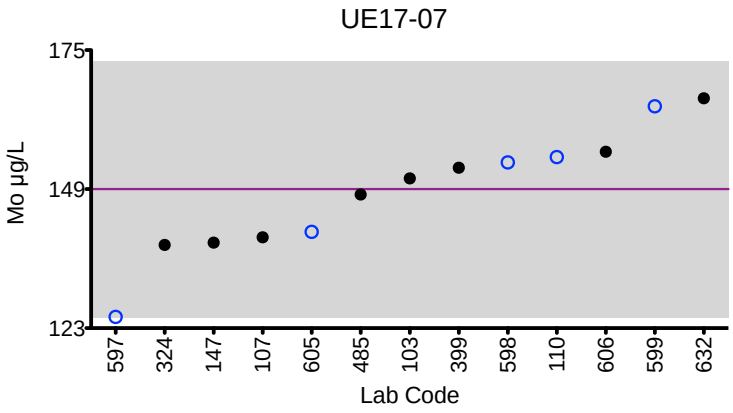
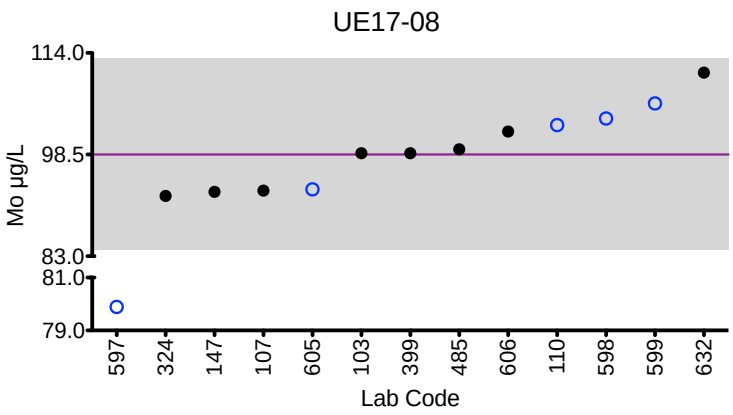
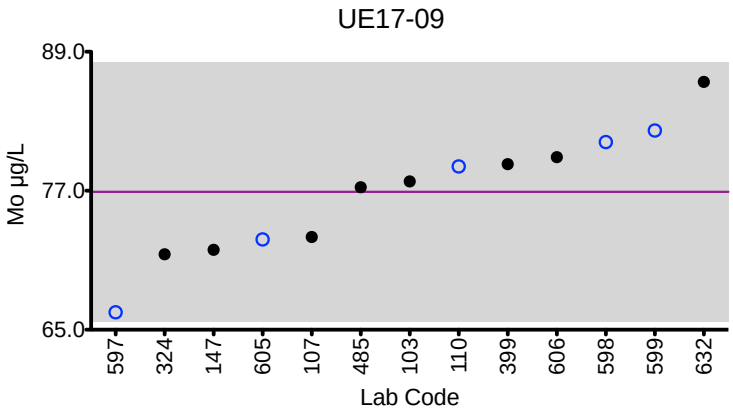
Results for Event #2, 2017: Summary Figures

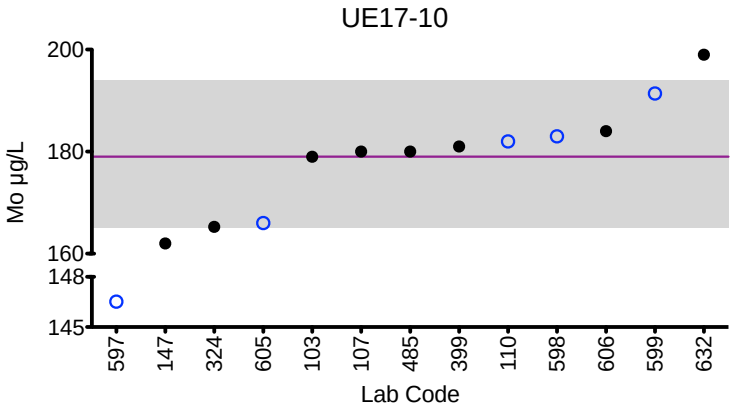
Urine Mo











Legend:
o C/HHEAR Labs ● Other Labs
Horizontal purple line = robust mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Urine Sb (µg/L)

Lab Code	Method	UE17-06	UE17-07	UE17-08	UE17-09	UE17-10
103	DRC/CC-ICP-MS	0.479	0.686	2.43	0.931	1.26
107	ICP-MS	0.52	0.72	3.0	1.0	1.4
110	ICP-MS	0.5	0.7	2.4	1.0	1.3
147	ICP-MS	0.504	0.660	2.47	0.968	1.27
399	ICP-MS	0.530	0.705	2.45	0.993	1.29
597	ICP-MS	0.59	1.3	2.38	1.15	1.26
598	ICP-MS	0.55	0.74	2.52	1.08	1.32
605	ICP-MS	0.52	0.662	2.36	0.984	1.25
606	ICP-MS	0.477	0.673	2.43	1.05	1.38
632	ICP-MS	0.769	0.764	2.58	1.06	1.44

Summary Statistics

	UE17-06	UE17-07	UE17-08	UE17-09	UE17-10
Robust Mean (x*)	0.52	0.71	2.45	1.02	1.31
Robust SD (s*)	0.04	0.05	0.08	0.06	0.06
Robust RSD (%)	7.7	7.0	3.3	5.9	4.6
Number of Sample Measurements (N)	10	10	10	10	10
Standard Uncertainty (*u*)	0.02	0.02	0.03	0.02	0.02

*Denotes a statistical Outlier.

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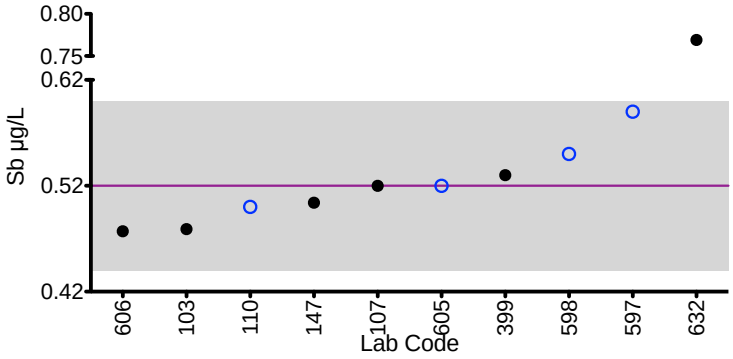
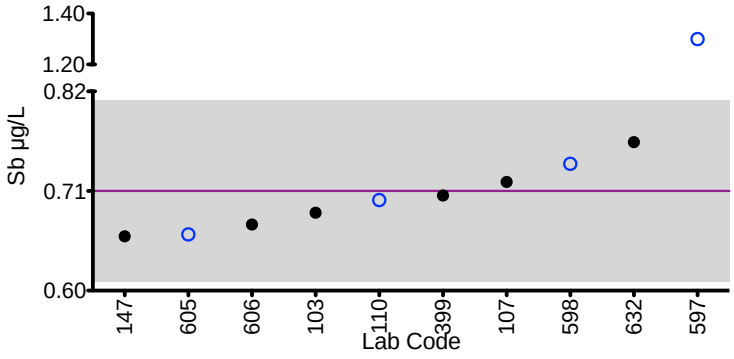
Results for Event #2, 2017: Summary Figures

Urine Sb

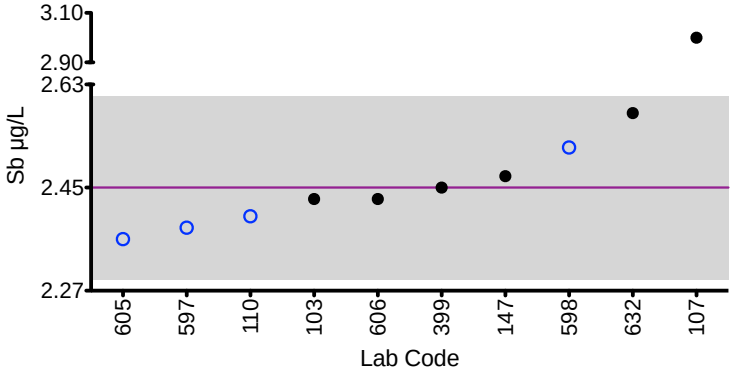
UE17-06



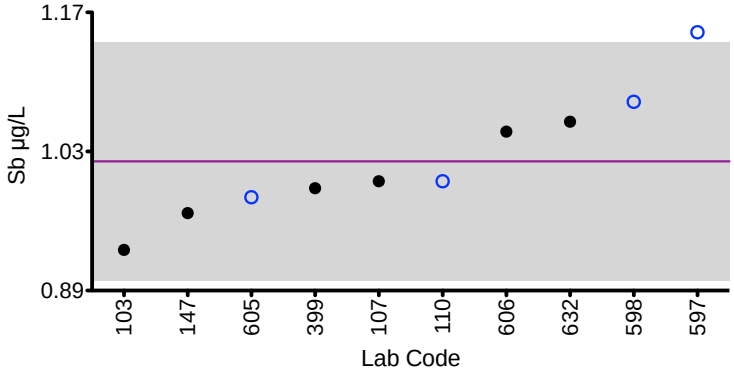
UE17-07



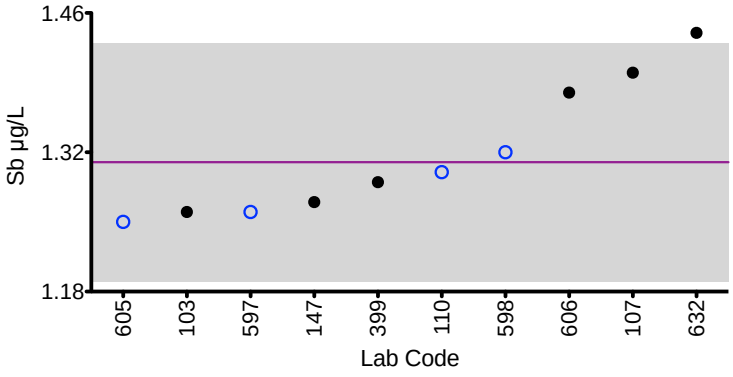
UE17-08



UE17-09



UE17-10



Legend:

o C/HHEAR Labs ● Other Labs

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Gray area = ±2SD of the mean.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Urine W (µg/L)

Lab Code	Method	UE17-06	UE17-07	UE17-08	UE17-09	UE17-10
107	ICP-MS	0.38	1.1	1.7	0.23	0.93
110	ICP-MS	0.39	1.12	1.84	0.25	0.92
147	ICP-MS	0.430	1.17	1.91	0.221	1.02
200	ICP-MS	0.4	1.4	2.3	0.26	1.1
324	ICP-MS	<1	1.03	1.64	<1	<1
399	ICP-MS	0.368	1.14	1.84	0.264	0.926
598	ICP-MS	*0.57	1.31	2.02	0.38	1.06
599	DRC/CC-ICP-MS	<1.0	0.36	1.20	<1.0	<1.0
605	ICP-MS	0.356	1.08	1.81	0.221	0.880
606	ICP-MS	0.375	1.12	1.81	0.238	0.932
632	ICP-MS	0.462	1.22	1.99	0.332	1.07

Summary Statistics

	UE17-06	UE17-07	UE17-08	UE17-09	UE17-10
Robust Mean (x*)	0.40	1.13	1.84	0.27	0.98
Robust SD (s*)	0.04	0.09	0.19	0.05	0.08
Robust RSD (%)	8.9	7.7	10.5	20.5	8.2
Number of Sample Measurements (N)	8	11	11	9	9
Standard Uncertainty (*u*)	NA	0.033	0.073	NA	NA

*Denotes a statistical Outlier.

Arithmetic means, SD, RSD and N are provided for samples UE17-06, UE17-09 and UE17-10.

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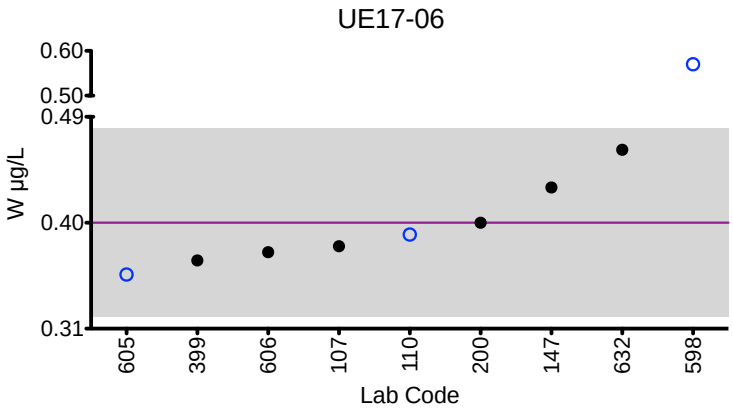
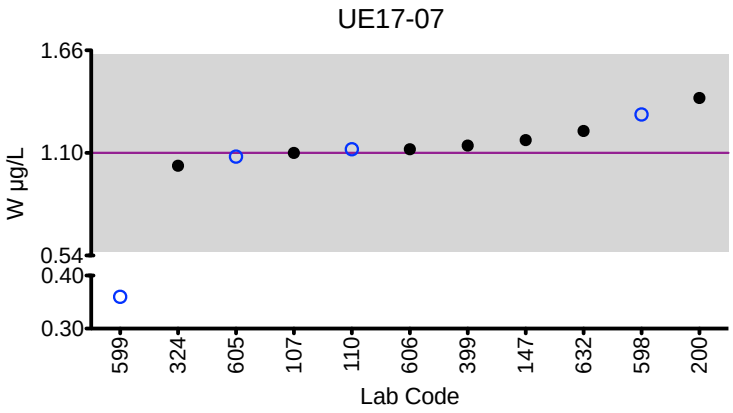
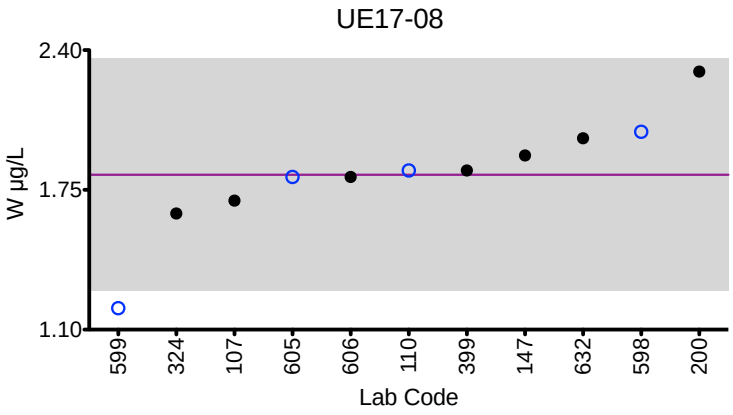
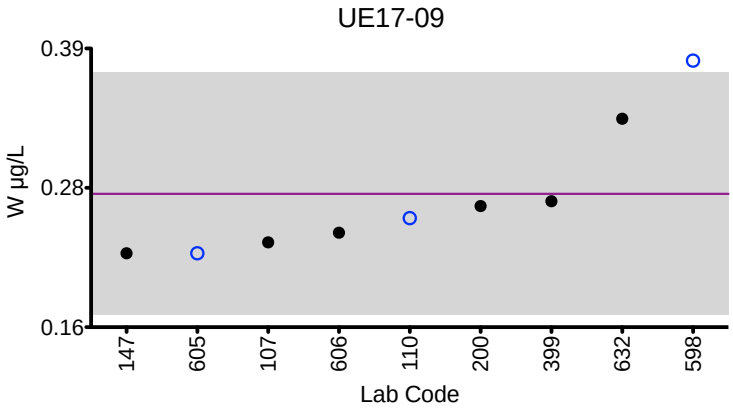
Results for Event #2, 2017: Summary Figures

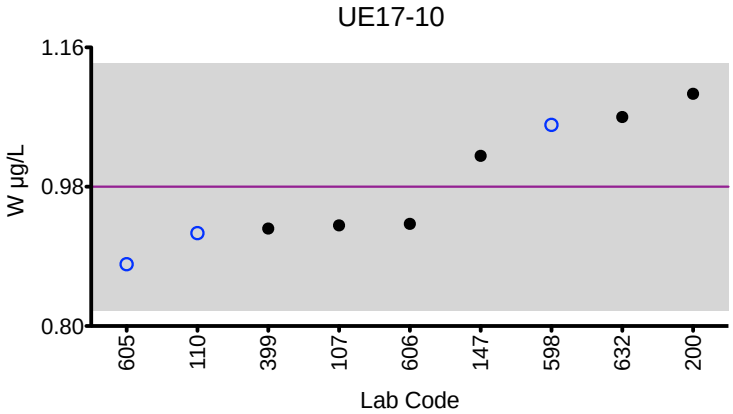
Urine W











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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Urine Ni (µg/L)

Lab Code	Method	UE17-06	UE17-07	UE17-08	UE17-09	UE17-10
107	ICP-MS	1.2	7.7	3.5	4.6	6.5
110	ICP-MS	<2.2	7.1	3.2	4.7	6.2
147	DRC/CC-ICP-MS	1.12	7.28	3.35	4.36	5.93
324	ICP-MS	1.25	6.88	3.39	4.58	6.03
391	DRC/CC-ICP-MS	*2.3	9	*4.4	*7.2	*8.4
401	DRC/CC-ICP-MS	1.4	8.8	3.7	4.6	6.4
485	HR-ICP-MS	1.04	7.28	3.46	4.43	6.24
598	ICP-MS	1.07	7.00	3.24	4.37	6.02
599	DRC/CC-ICP-MS	0.94	7.84	3.55	5.03	6.51

Summary Statistics

	UE17-06	UE17-07	UE17-08	UE17-09	UE17-10
Arithmetic Mean ($\bar{x}$)	1.1	7.7	3.4	4.6	6.2
Arithmetic SD (s)	0.2	0.8	0.2	0.2	0.2
Arithmetic RSD (%)	18.2	10.4	5.9	4.3	3.2
Number of Sample Measurements (N)	7	9	8	8	8

*Denotes a statistical Outlier.

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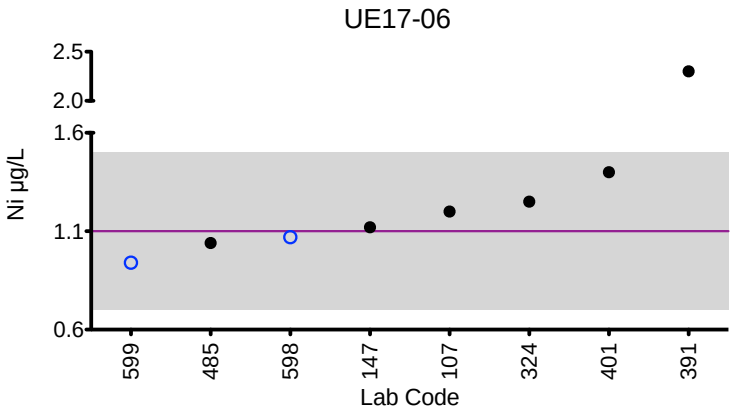
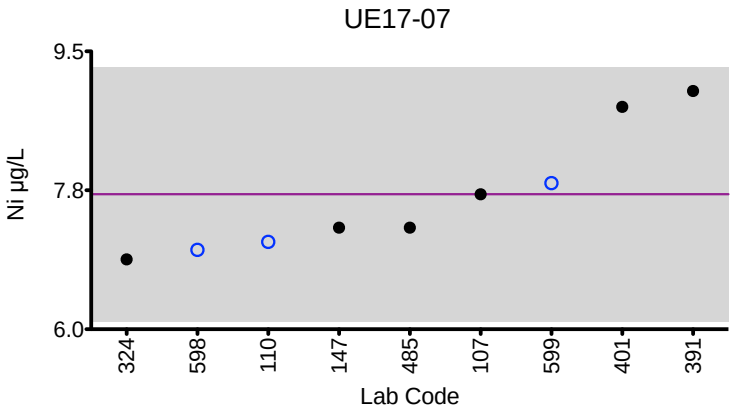
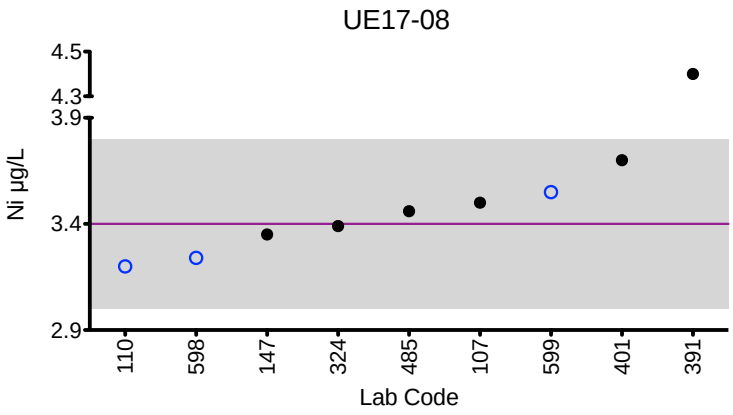
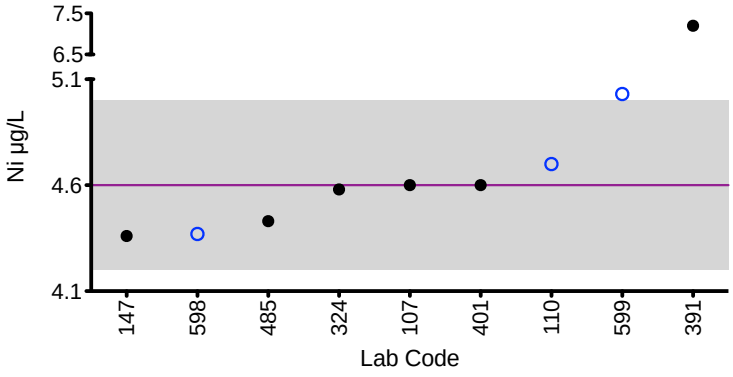
Results for Event #2, 2017: Summary Figures

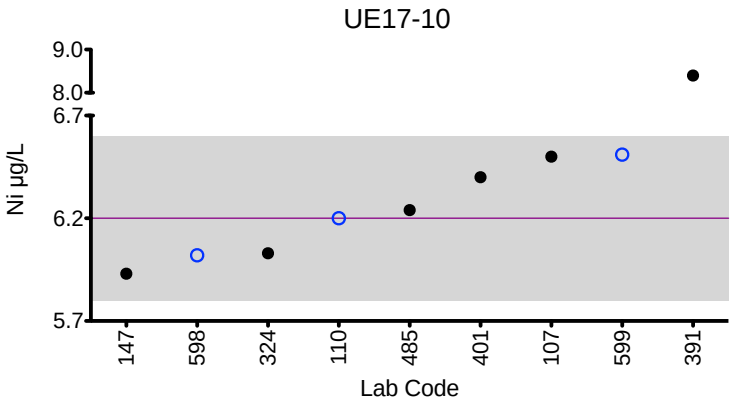
Urine Ni











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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Urine Pt (µg/L)

Lab Code	Method	UE17-06	UE17-07	UE17-08	UE17-09	UE17-10
107	ICP-MS	0.19	0.30	0.72	0.37	3.4
110	ICP-MS	0.16	0.30	0.74	0.39	3.41
147	ICP-MS	0.205	*0.226	*0.615	*0.246	3.16
399	ICP-MS	0.154	0.287	0.703	0.376	3.35
598	ICP-MS	0.17	0.29	0.70	0.36	3.11
632	ICP-MS	0.146	0.275	0.735	0.376	3.37

Summary Statistics

	UE17-06	UE17-07	UE17-08	UE17-09	UE17-10
Arithmetic Mean ($\bar{x}$)	0.17	0.29	0.72	0.37	3.30
Arithmetic SD (s)	0.02	0.01	0.02	0.01	0.13
Arithmetic RSD (%)	11.8	3.4	2.8	2.7	3.9
Number of Sample Measurements (N)	6	5	5	5	6

*Denotes a statistical Outlier.

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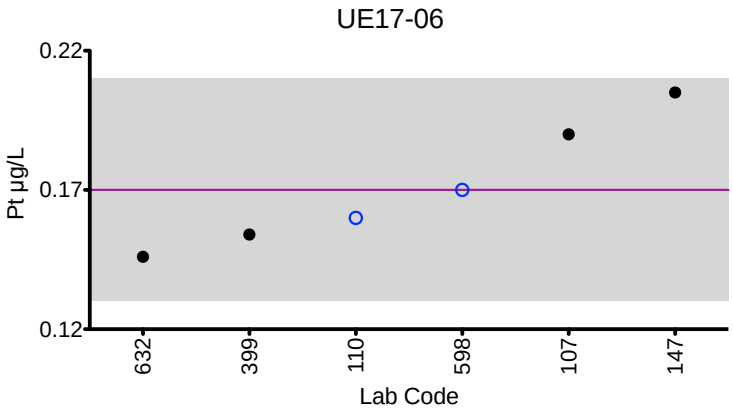
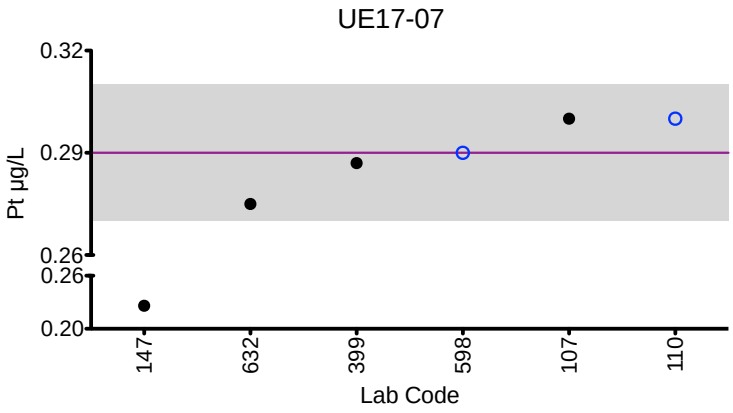
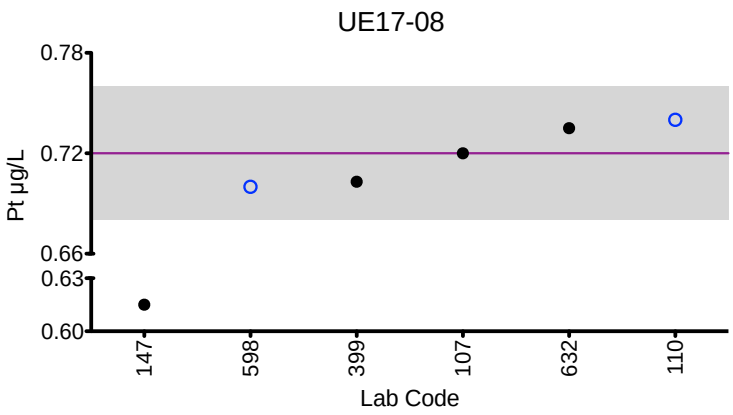
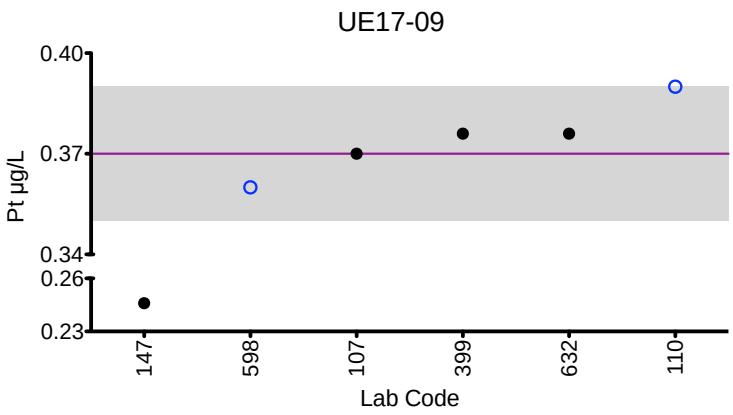
Results for Event #2, 2017: Summary Figures

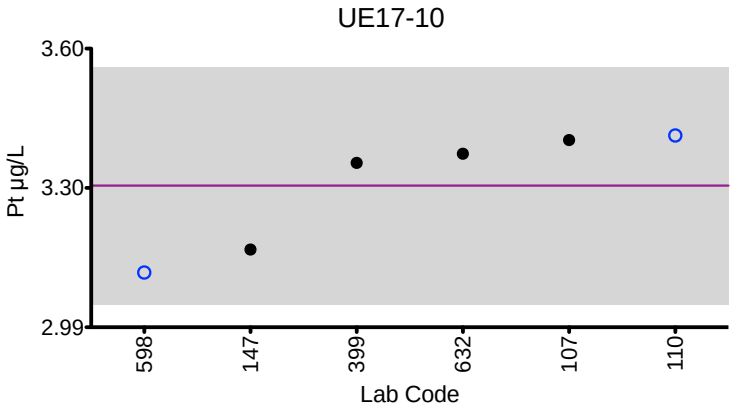
Urine Pt











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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Urine Se (µg/L)

Lab Code	Method	UE17-06	UE17-07	UE17-08	UE17-09	UE17-10
103	DRC/CC-ICP-MS	11.3	163	37.2	142	90.0
110	DRC/CC-ICP-MS	12.7	167	42.5	143	88.1
147	ICP-MS	14.0	156	39.4	137	87.7
597	ICP-MS	12	*138.3	32.4	126.7	77.0
598	DRC/CC-ICP-MS	11.3	162	38.1	144	92.6
632	DRC/CC-ICP-MS	12.8	164	38.5	134	86.0
684	DRC/CC-ICP-MS	12.1	156	35.6	133	85.5

Summary Statistics

	UE17-06	UE17-07	UE17-08	UE17-09	UE17-10
Arithmetic Mean ($\bar{x}$)	12.3	161	37.7	137	86.7
Arithmetic SD (s)	1.0	4	3.1	6	4.9
Arithmetic RSD (%)	8.1	2.5	8.2	4.4	5.7
Number of Sample Measurements (N)	7	6	7	7	7

*Denotes a statistical Outlier.

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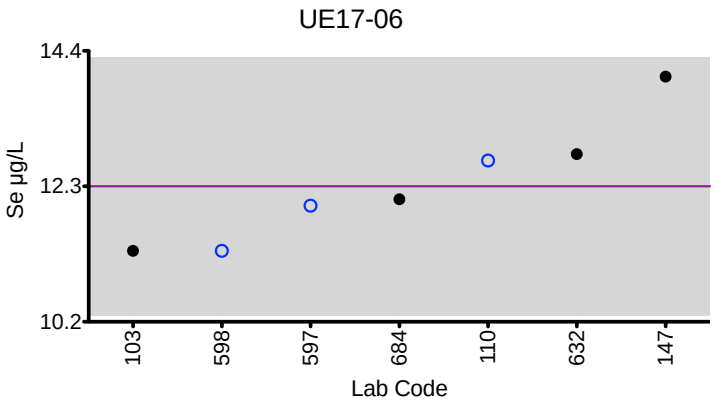
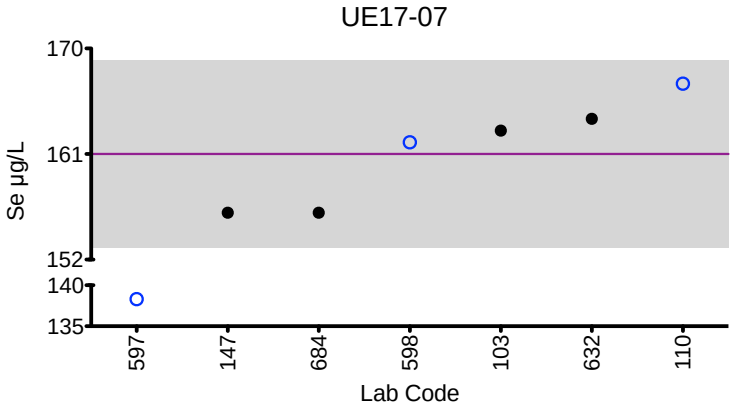
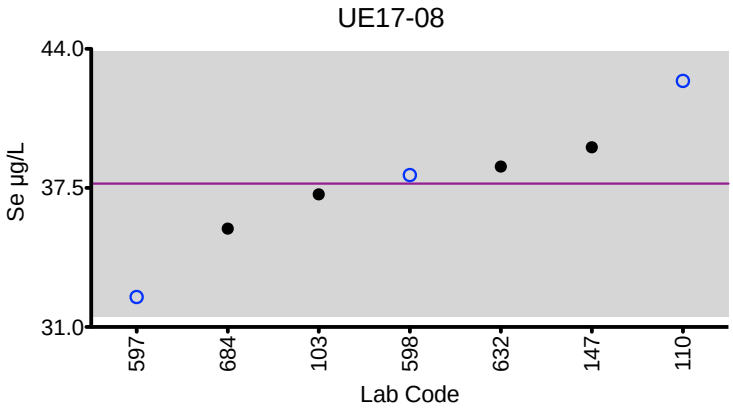
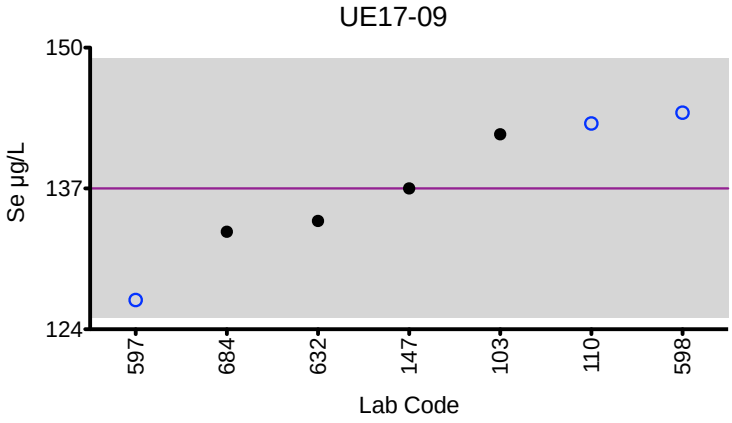
Results for Event #2, 2017: Summary Figures

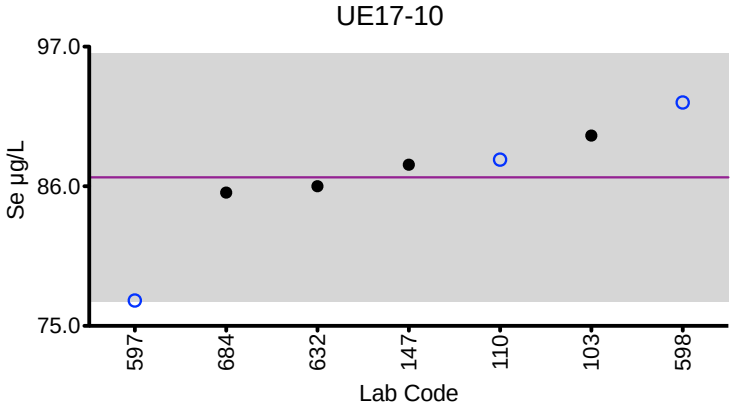
Urine Se











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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Urine Sn (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
107	ICP-MS	1.8	0.84	7.9	2.6	1.7
110	ICP-MS	1.8	0.8	9.0	2.5	1.6
147	ICP-MS	1.65	0.944	6.59	3.12	1.76
399	ICP-MS	1.86	0.804	8.38	2.52	1.60
597	ICP-MS	1	0.7	2.7	2.8	1.7
598	ICP-MS	1.62	1.19	4.53	3.40	2.08
599	DRC/CC-ICP-MS	1.97	0.89	8.87	2.40	1.72
605	ICP-MS	1.29	0.624	6.58	2.25	1.40
Summary Statistics						
		UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Arithmetic Mean ($\bar{x}$)		1.62	0.85	6.82	2.70	1.70
Arithmetic SD (s)		0.32	0.17	2.23	0.39	0.19
Arithmetic RSD (%)		19.8	20.0	32.7	14.4	11.2
Number of Sample Measurements (N)		8	8	8	8	8

*Denotes a statistical Outlier.

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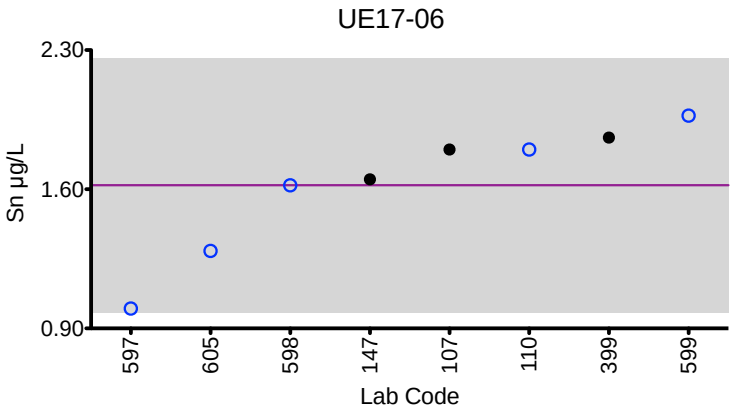
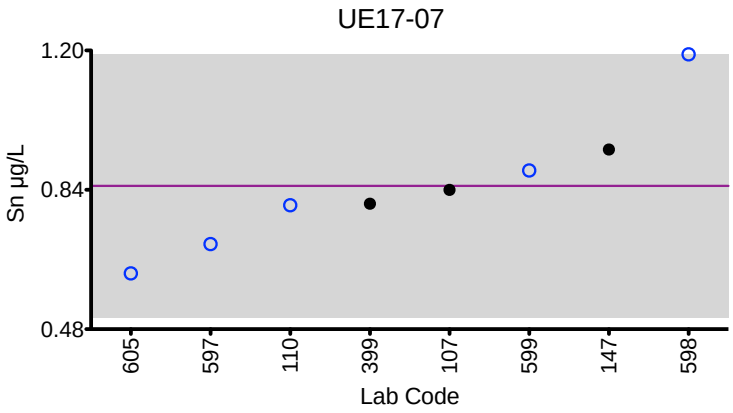
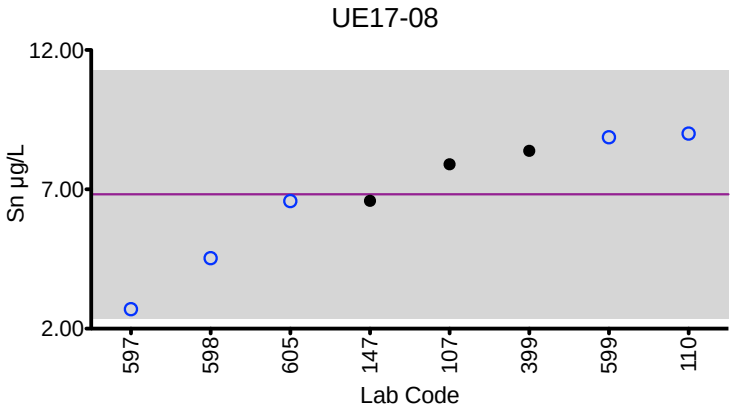
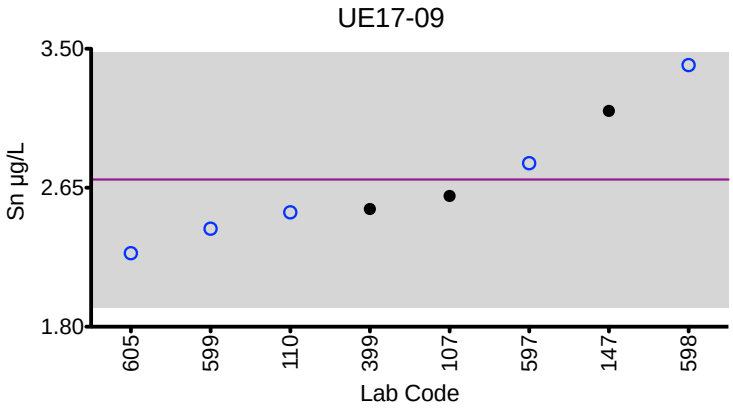
Results for Event #2, 2017: Summary Figures

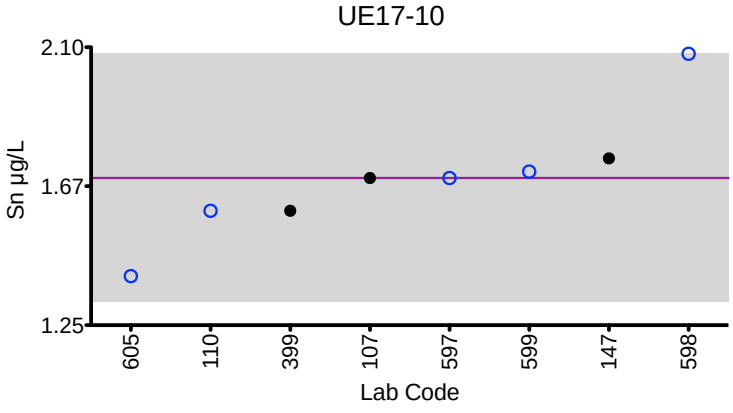
Urine Sn











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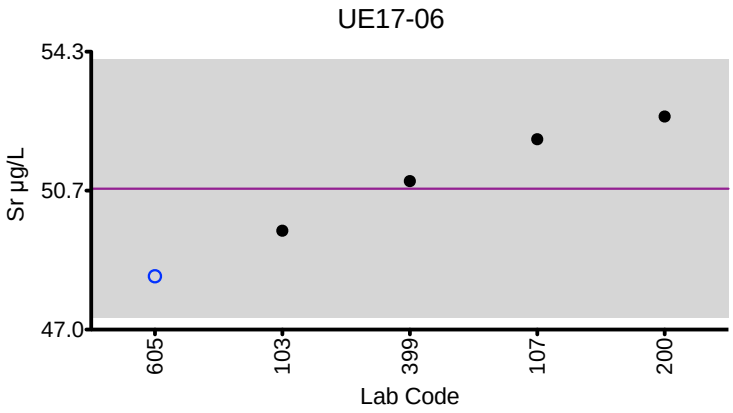
Results for Event #2, 2017:
Laboratory Data and Summary Statistics

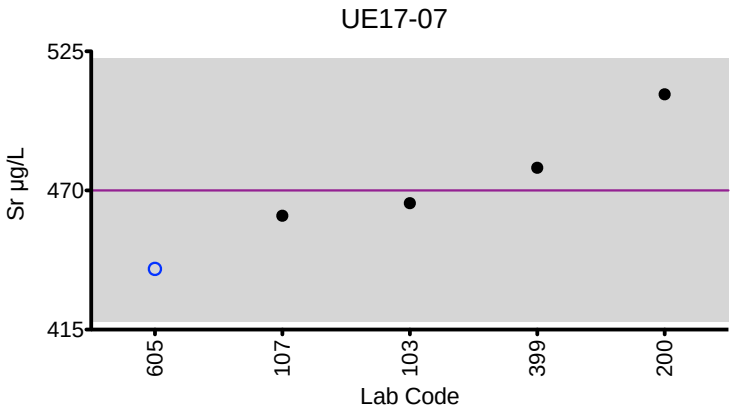
Urine Sr (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
103	DRC/CC-ICP-MS	49.6	465	195	306	92.7
107	ICP-MS	52	460	190	310	100
200	ICP-MS	52.6	508.0	210.0	324.0	105.0
399	DRC/CC-ICP-MS	50.9	479	195	319	96.0
605	ICP-MS	48.4	439	188	295	88.6
Summary Statistics						
		UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Arithmetic Mean ($\bar{x}$)		50.7	470	196	311	96.5
Arithmetic SD (s)		1.7	26	9	11	6.4
Arithmetic RSD (%)		3.4	5.5	4.6	3.5	6.6
Number of Sample Measurements (N)		5	5	5	5	5

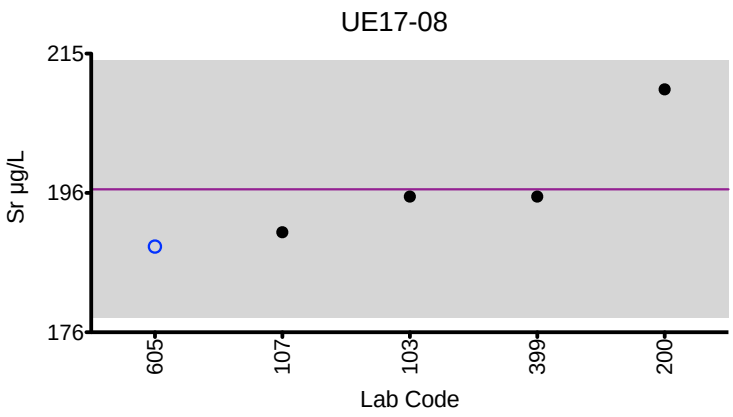
*Denotes a statistical Outlier.

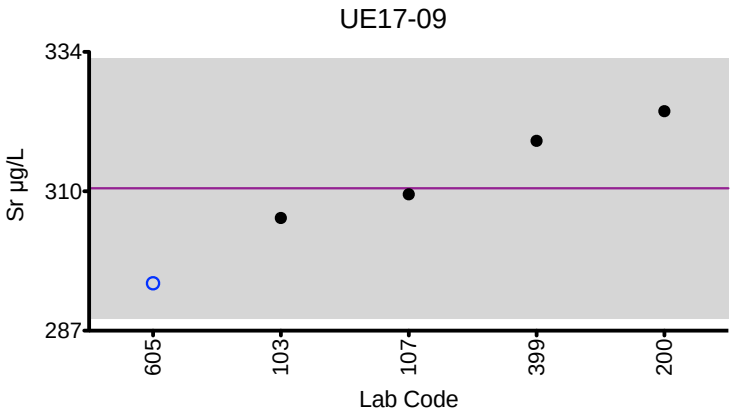
Results for Event #2, 2017:
Summary Figures

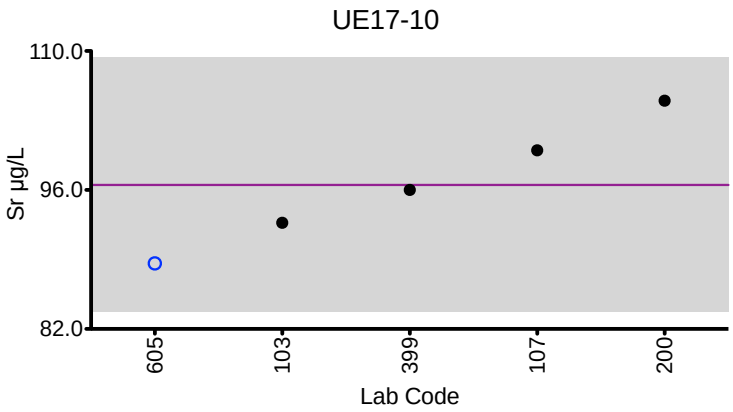
Urine Sr











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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Urine Zn (µg/L)

Lab Code	Method	UE17-06	UE17-07	UE17-08	UE17-09	UE17-10
110	ICP-MS	74.5	625	197	502	770
147	ICP-MS	84.3	660	212	549	804
324	ICP-MS	70.17	591.23	188.75	479.07	745.61
401	DRC/CC-ICP-MS	75	635	202	515	795
597	ICP-MS	58.82	538.86	165.71	442.85	654.74
598	ICP-MS	58.8	527	169	423	657
632	ICP-MS	*456	674	212	538	849

Summary Statistics

	UE17-06	UE17-07	UE17-08	UE17-09	UE17-10
Arithmetic Mean ($\bar{x}$)	70	607	192	493	754
Arithmetic SD (s)	10	57	19	47	74
Arithmetic RSD (%)	14.3	9.4	9.9	9.5	9.8
Number of Sample Measurements (N)	6	7	7	7	7

*Denotes a statistical Outlier.

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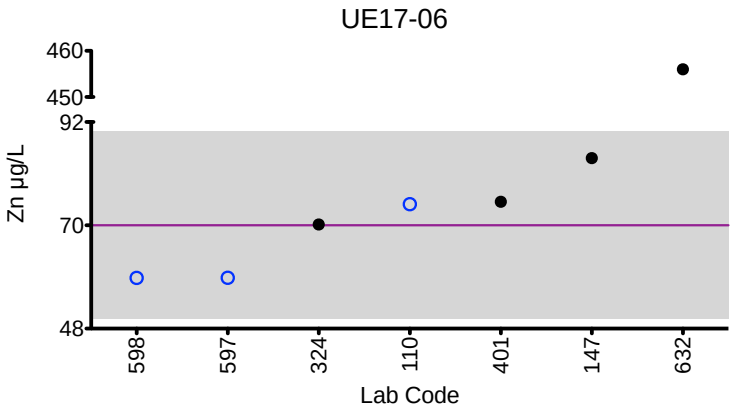
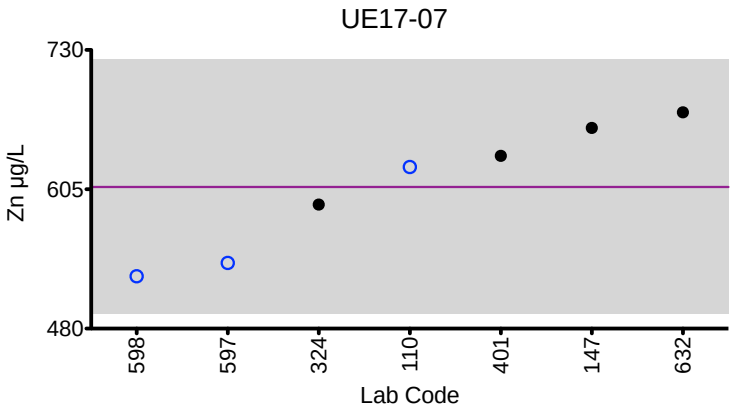
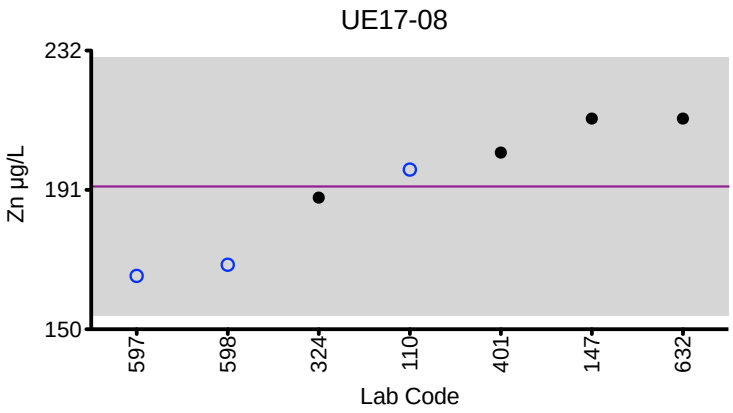
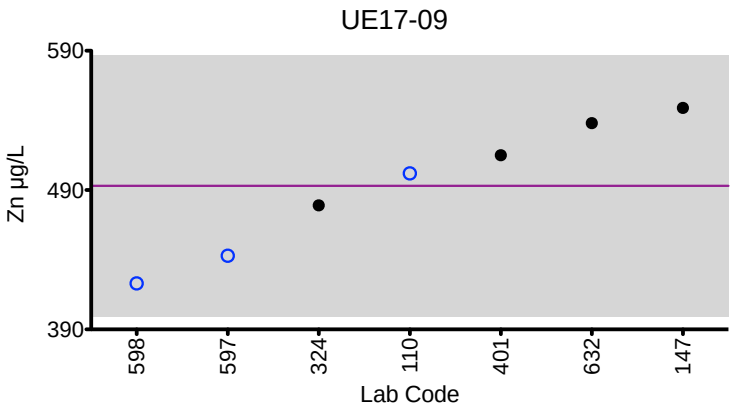
Results for Event #2, 2017: Summary Figures

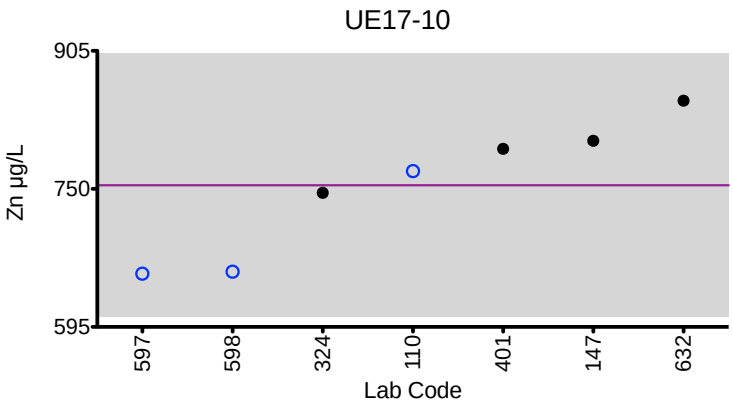
Urine Zn











Legend:
o C/HHEAR Labs ● Other Labs
Horizontal purple line = arithmetic mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Urine Al (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
147	DRC/CC-ICP-MS	<13.8	<13.8	<13.8	<13.8	15.9
324	ICP-MS	8.35	11.50	22.13	17.11	22.55
485	HR-ICP-MS	5.16	9.47	18.8	15.9	19.6
598	ICP-MS	3.64	2.60	8.57	2.51	7.26
Summary Statistics						
		UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Arithmetic Mean ($\bar{x}$)		5.7	7.9	16.5	11.8	16.3
Arithmetic SD (s)		2.4	4.7	7.1	8.1	6.6
Arithmetic RSD (%)		42.1	60.0	43.0	69.0	40.5
Number of Sample Measurements (N)		3	3	3	3	4

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Urine Fe (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
324	ICP-MS	4.12	4.46	4.04	4.58	4.19
598	DRC/CC-ICP-MS	3.61	5.67	4.25	4.77	5.50

Summary Statistics					
	UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Arithmetic Mean ($\bar{x}$)	3.9	5.1	4.1	4.7	4.8
Arithmetic SD (s)	0.4	0.9	0.1	0.1	0.9
Arithmetic RSD (%)	10.3	17.6	2.4	2.1	18.8
Number of Sample Measurements (N)	2	2	2	2	2

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Urine V (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
116	DRC/CC-ICP-MS	0.603	1.35	3.23	0.225	0.930
147	DRC/CC-ICP-MS	0.515	1.11	2.66	0.168	0.745
485	HR-ICP-MS	0.59	1.24	2.92	0.20	0.873
598	DRC/CC-ICP-MS	0.62	1.41	3.21	0.21	0.95
Summary Statistics						
		UE17-06	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
Arithmetic Mean ($\bar{x}$)		0.582	1.28	3.00	0.201	0.875
Arithmetic SD (s)		0.046	0.13	0.27	0.024	0.092
Arithmetic RSD (%)		7.9	10.2	9.0	11.9	10.5
Number of Sample Measurements (N)		4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #2, 2017: Additional Elements in Urine

Urine Ag (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
147	ICP-MS	< 0.302	< 0.302	< 0.302	< 0.302	< 0.302

Urine B (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
200	ICP-MS	248	475	464	432	486

Urine Bi (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
147	ICP-MS	< 0.230	< 0.230	< 0.230	< 0.230	< 0.230

Urine Ca (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
598	ICP-AES/OES	13600	22900	17400	20400	22100

Urine I (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
107	ICP-MS	14	37	28	34	36

Urine Li (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
147	ICP-MS	3.82	8.47	5.14	7.08	7.91

Urine Mg (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
597	ICP-MS	9166.9	17666	13709.7	15682.0	16818.9

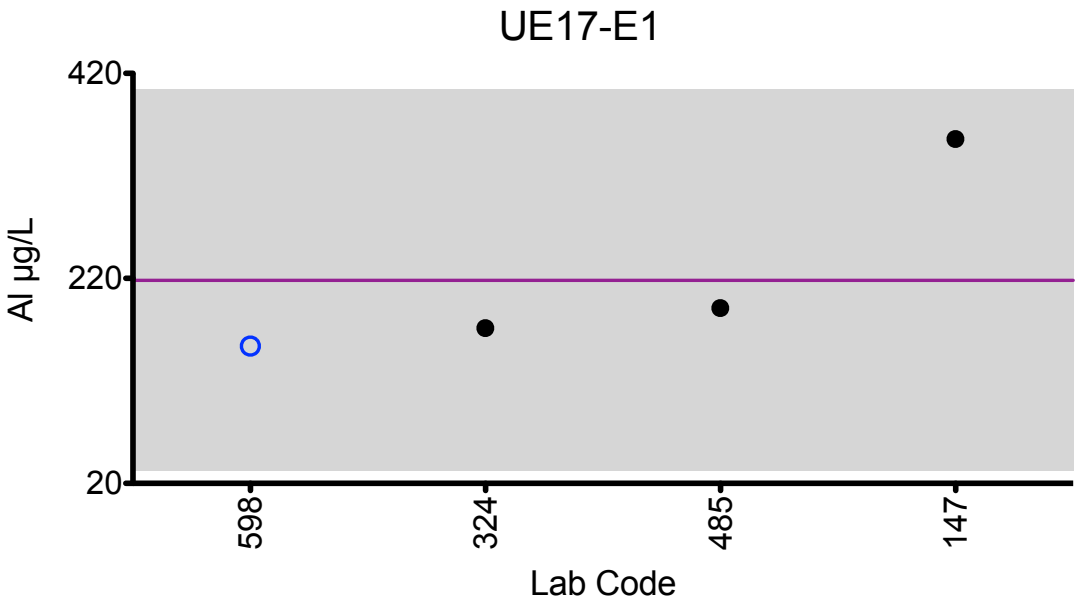
Urine Te (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
110	ICP-MS	0.5	1.6	2.4	< 0.3	0.7
599	DRC/CC-ICP-MS	2.28	3.13	3.79	2.23	2.71

Urine Th (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
147	ICP-MS	< 0.00557	< 0.00557	< 0.00557	< 0.00557	< 0.00557

Urine Ti (µg/L)						
Lab Code	**Method**	**UE17-06**	**UE17-07**	**UE17-08**	**UE17-09**	**UE17-10**
485	HR-ICP-MS	<0.5	<0.5	<0.5	<0.5	<0.5
598	DRC/CC-ICP-MS	10.4	14.4	12.5	13.3	17.3

Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Al (µg/L)					
Lab Code	**Method**	**UE17-E1**	**Lab Code**	**Method**	**UE17-E1**
147	DRC/CC-ICP-MS	356	485	HR-ICP-MS	191
324	ICP-MS	171.42	598	ICP-MS	154



Mean	218
SD	93
RSD (%)	42.7
N	4
Standard U	NA

Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

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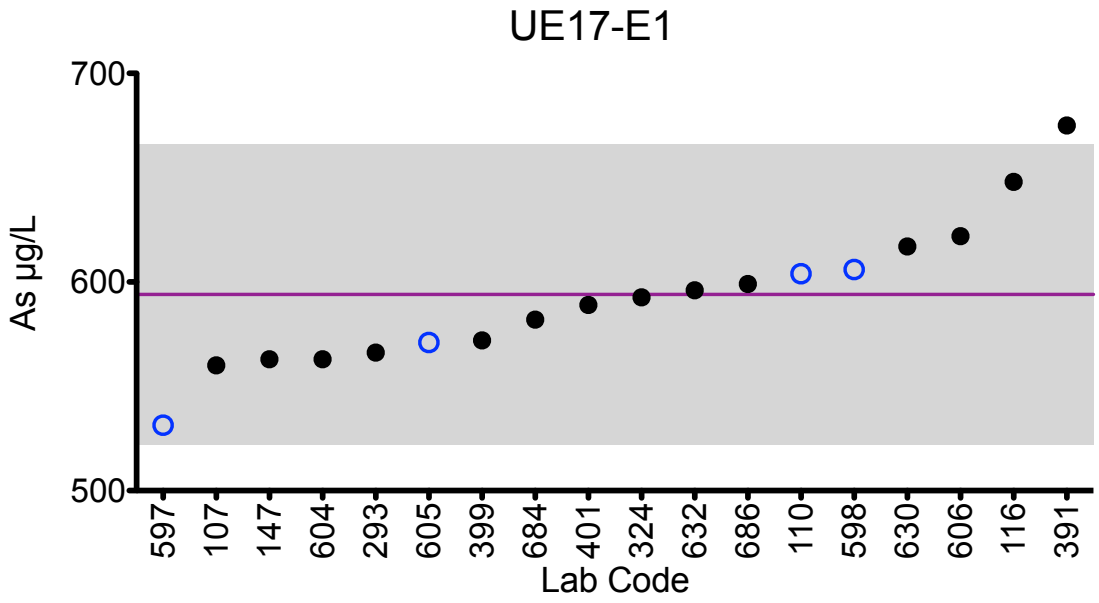
Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine As (µg/L)

Lab Code	Method	UE17-E1	Lab Code	Method	UE17-E1
107	ICP-MS	560	597	ICP-MS	531.4
110	DRC/CC-ICP-MS	604	598	DRC/CC-ICP-MS	606
116	DRC/CC-ICP-MS	648	604	DRC/CC-ICP-MS	563
147	ICP-MS	563	605	ICP-MS	571
293	DRC/CC-ICP-MS	566.2	606	ICP-MS	622
324	ICP-MS	592.65	630	ICP-MS	617
391	DRC/CC-ICP-MS	675.0	632	DRC/CC-ICP-MS	596
399	DRC/CC-ICP-MS	572	684	DRC/CC-ICP-MS	582
401	DRC/CC-ICP-MS	589	686	DRC/CC-ICP-MS	599



Mean	594
SD	36
RSD (%)	6.1
N	17
Standard U	10.5

Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
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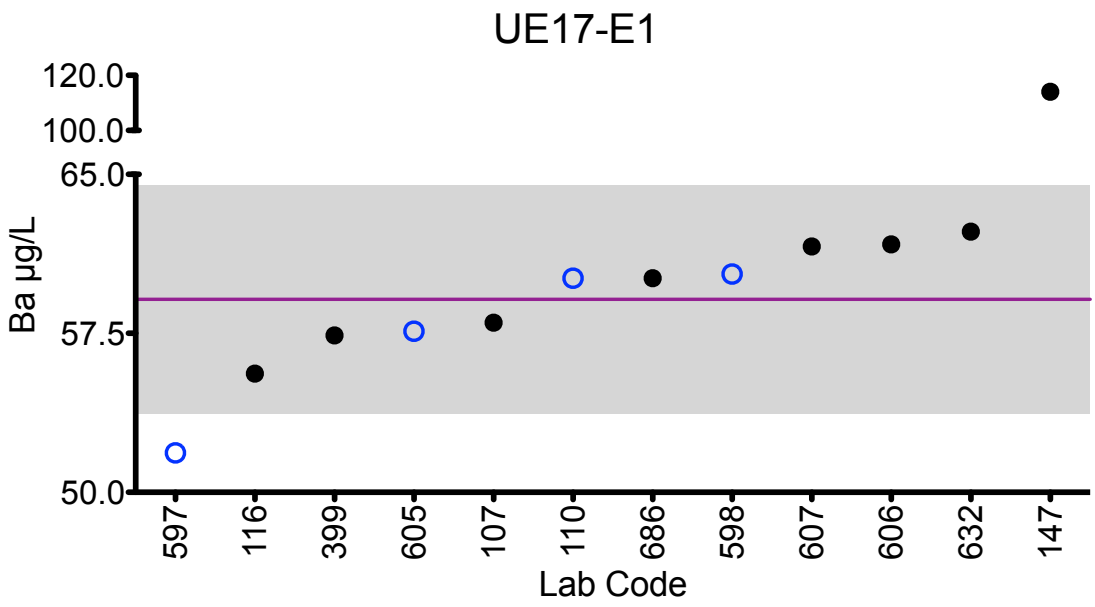
Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Ba (µg/L)

Lab Code	Method	UE17-E1	Lab Code	Method	UE17-E1
107	ICP-MS	58	598	ICP-MS	60.3
110	ICP-MS	60.1	605	ICP-MS	57.6
116	DRC/CC-ICP-MS	55.6	606	ICP-MS	61.7
147	ICP-MS	114	607	ICP-MS	61.6
399	ICP-MS	57.4	632	ICP-MS	62.3
597	ICP-MS	51.86	686	ICP-MS	60.1



Mean	59.1
SD	2.7
RSD (%)	4.6
N	11
Standard U	1.04

Legend:

o CHEAR Labs ● Other Labs
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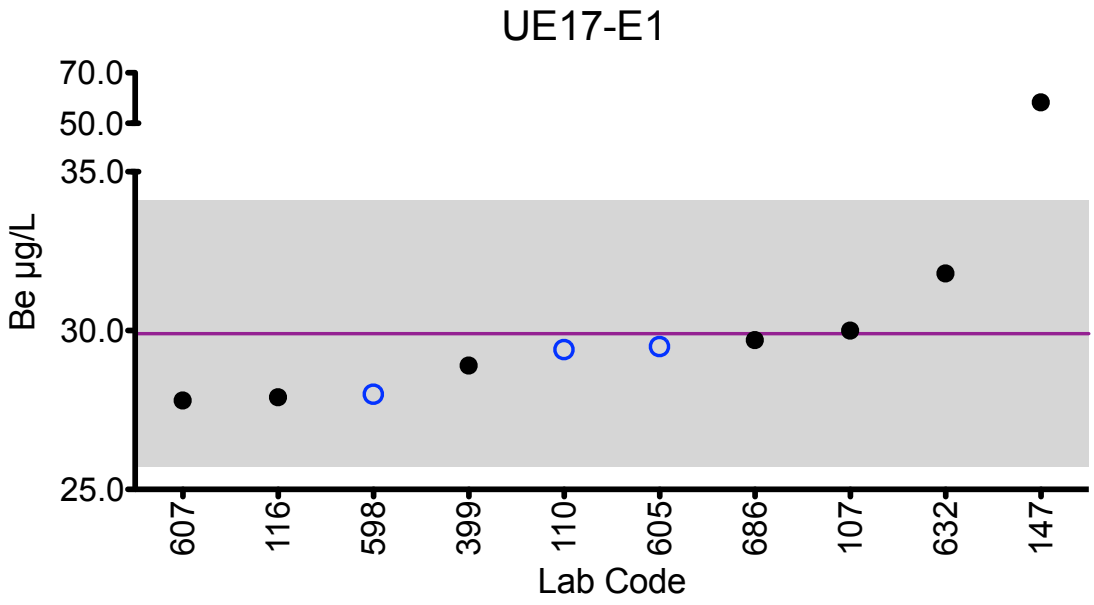
Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Be (µg/L)					
Lab Code	**Method**	**UE17-E1**	**Lab Code**	**Method**	**UE17-E1**
107	ICP-MS	30	598	ICP-MS	28.0
110	ICP-MS	29.4	605	ICP-MS	29.5
116	ICP-MS	27.9	607	ICP-MS	27.8
147	ICP-MS	58.3	632	ICP-MS	31.8
399	ICP-MS	28.9	686	ICP-MS	29.7



Mean	29.9
SD	2.1
RSD (%)	7.0
N	11
Standard U	0.792

Legend:

o CHEAR Labs ● Other Labs
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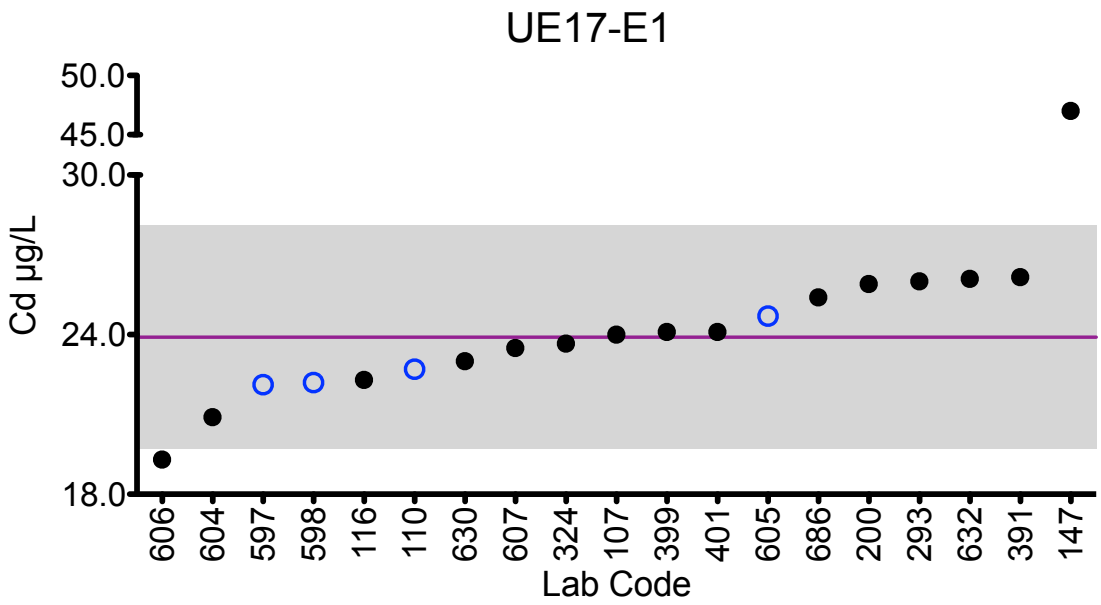
Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Cd (µg/L)

Lab Code	Method	UE17-E1	Lab Code	Method	UE17-E1
107	DRC/CC-ICP-MS	24	597	ICP-MS	22.12
110	ICP-MS	22.7	598	DRC/CC-ICP-MS	22.2
116	DRC/CC-ICP-MS	22.3	604	DRC/CC-ICP-MS	20.9
147	ICP-MS	47.0	605	ICP-MS	24.7
200	ICP-MS	25.9	606	DRC/CC-ICP-MS	19.3
293	DRC/CC-ICP-MS	26.0	607	ICP-MS	23.5
324	ICP-MS	23.66	630	ICP-MS	23.0
391	DRC/CC-ICP-MS	26.16	632	DRC/CC-ICP-MS	26.1
399	DRC/CC-ICP-MS	24.1	686	ICP-MS	25.4
401	DRC/CC-ICP-MS	24.1			



Mean	23.9
SD	2.1
RSD (%)	8.8
N	19
Standard U	0.599

Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

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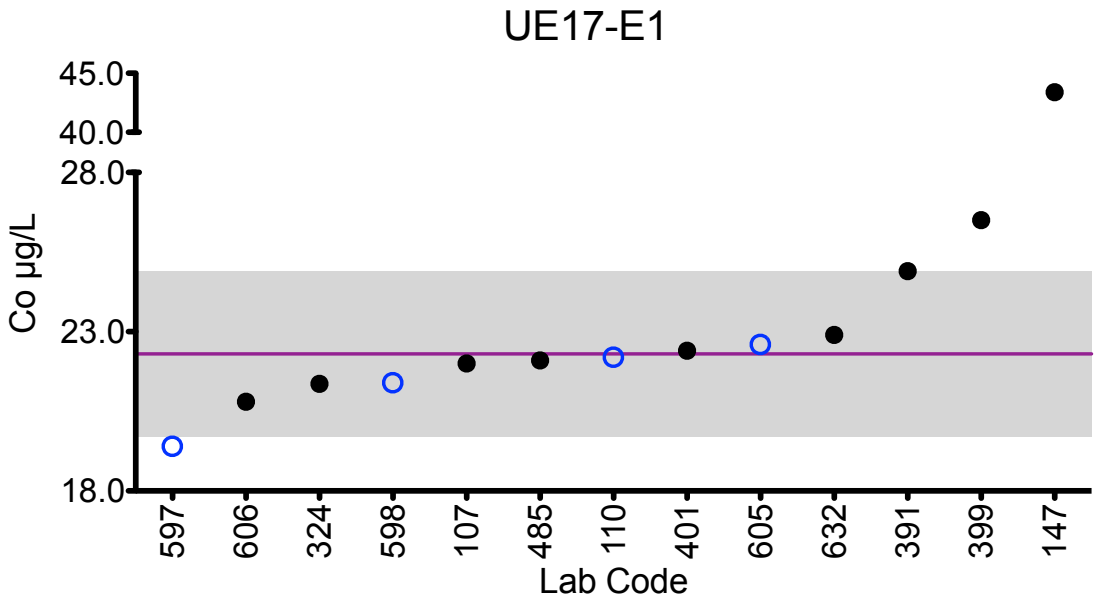
Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Co (µg/L)

Lab Code	Method	UE17-E1	Lab Code	Method	UE17-E1
107	ICP-MS	22	485	HR-ICP-MS	22.1
110	ICP-MS	22.2	597	ICP-MS	19.4
147	ICP-MS	43.4	598	ICP-MS	21.4
324	ICP-MS	21.36	605	ICP-MS	22.6
391	DRC/CC-ICP-MS	24.9	606	ICP-MS	20.8
399	DRC/CC-ICP-MS	26.5	632	ICP-MS	22.9
401	DRC/CC-ICP-MS	22.4			



Mean	22.3
SD	1.3
RSD (%)	5.8
N	13
Standard U	0.462

Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

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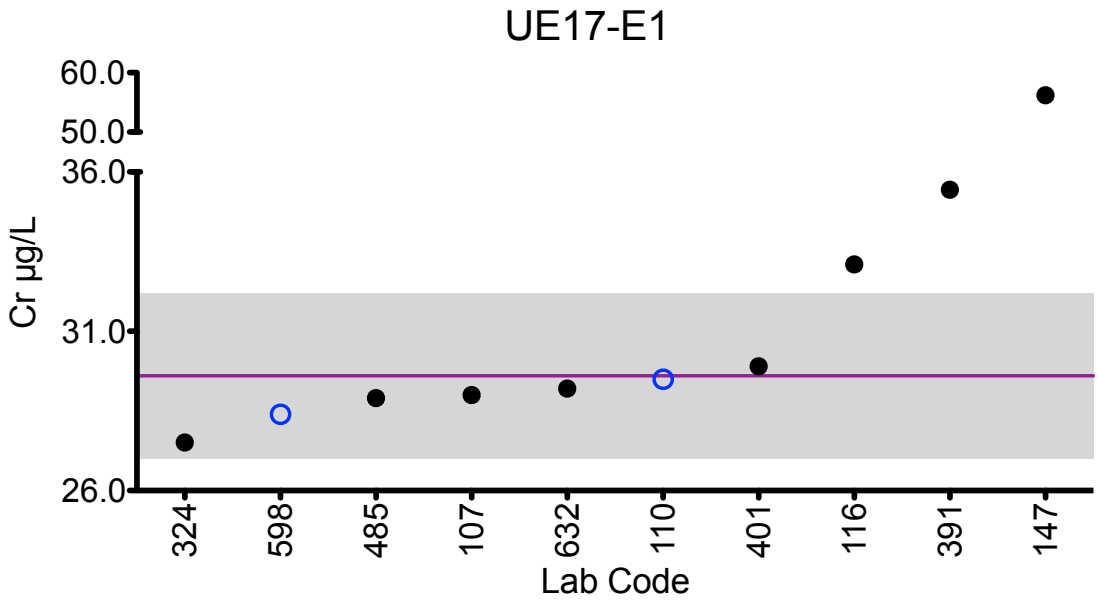
Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Cr (µg/L)					
Lab Code	**Method**	**UE17-E1**	**Lab Code**	**Method**	**UE17-E1**
107	ICP-MS	29	391	DRC/CC-ICP-MS	35.44
110	DRC/CC-ICP-MS	29.5	401	DRC/CC-ICP-MS	29.9
116	DRC/CC-ICP-MS	33.1	485	HR-ICP-MS	28.9
147	DRC/CC-ICP-MS	56.2	598	DRC/CC-ICP-MS	28.4
324	ICP-MS	27.51	632	DRC/CC-ICP-MS	29.2



Mean	29.6
SD	1.3
RSD (%)	4.4
N	10
Standard U	0.523

Legend:

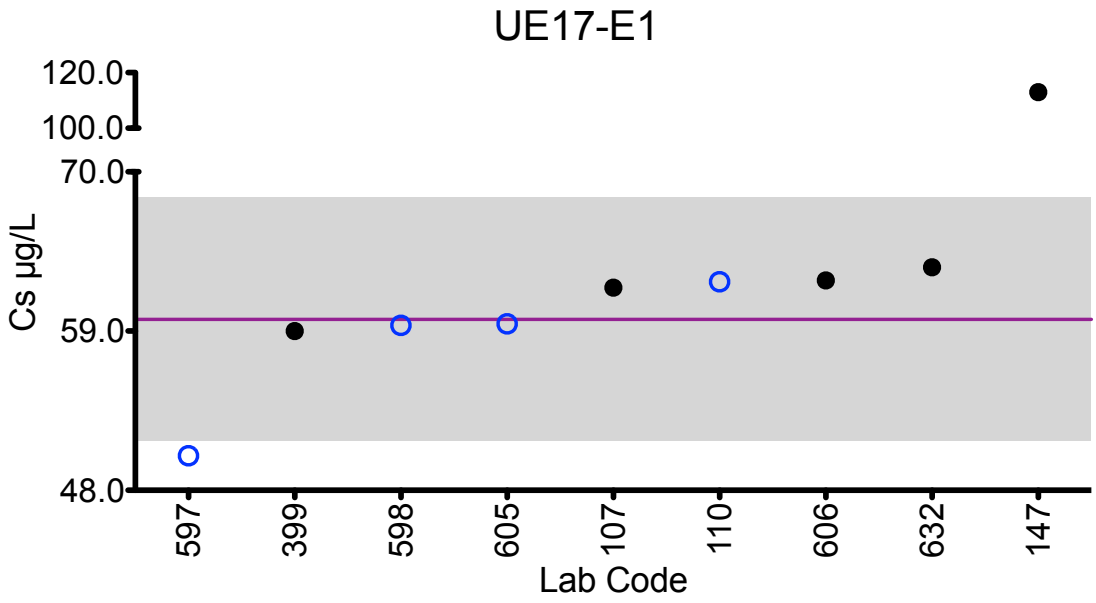
o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Cs (µg/L)

Lab Code	Method	UE17-E1	Lab Code	Method	UE17-E1
107	ICP-MS	62	598	ICP-MS	59.4
110	ICP-MS	62.4	605	ICP-MS	59.5
147	ICP-MS	*113	606	ICP-MS	62.5
399	ICP-MS	59.0	632	ICP-MS	63.4
597	ICP-MS	50.39			



Mean	59.8
SD	4.2
RSD (%)	7.0
N	8
Standard U	NA

Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
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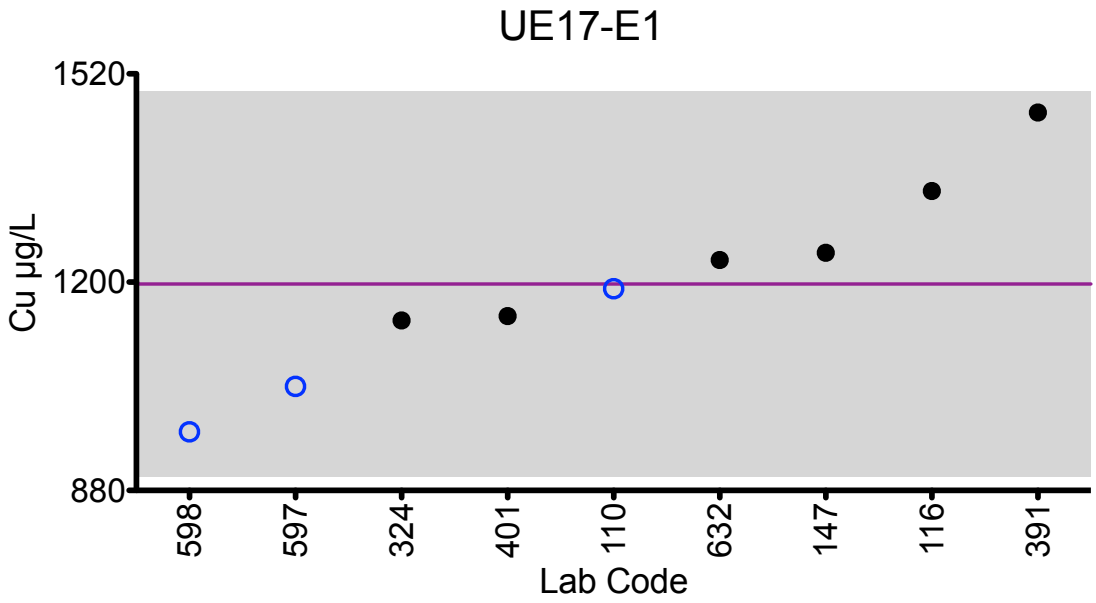
Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Cu (µg/L)

Lab Code	Method	UE17-E1	Lab Code	Method	UE17-E1
110	ICP-MS	1190	401	DRC/CC-ICP-MS	1148
116	DRC/CC-ICP-MS	1340	597	ICP-MS	1039.9
147	ICP-MS	1245	598	ICP-MS	970
324	ICP-MS	1141.15	632	ICP-MS	1234
391	DRC/CC-ICP-MS	1460.5			



Mean	1197
SD	148
RSD (%)	12.4
N	9
Standard U	NA

Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

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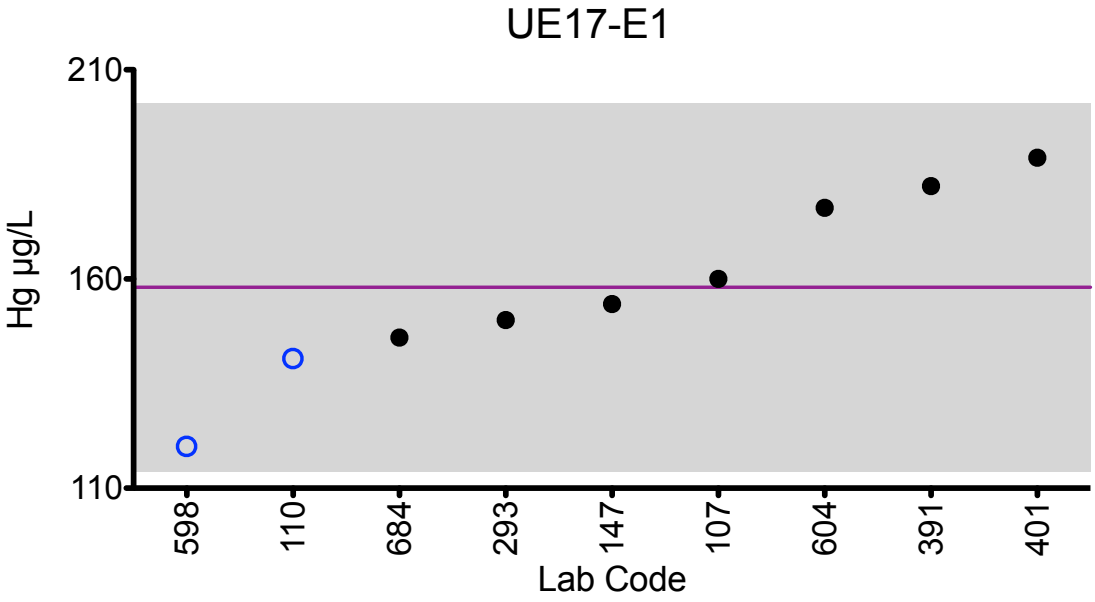
Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Hg (µg/L)

Lab Code	Method	UE17-E1	Lab Code	Method	UE17-E1
107	DRC/CC-ICP-MS	160	598	ICP-MS	120
110	ICP-MS	141	604	DRC/CC-ICP-MS	177
147	CV-AAS	154	605	ICP-MS	>40.0
293	DRC/CC-ICP-MS	150.2	606	ICP-MS	>50.0
391	DRC/CC-ICP-MS	182.22	684	DRC/CC-ICP-MS	146
401	DRC/CC-ICP-MS	189			



Mean	158
SD	22
RSD (%)	13.9
N	9
Standard U	NA

Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

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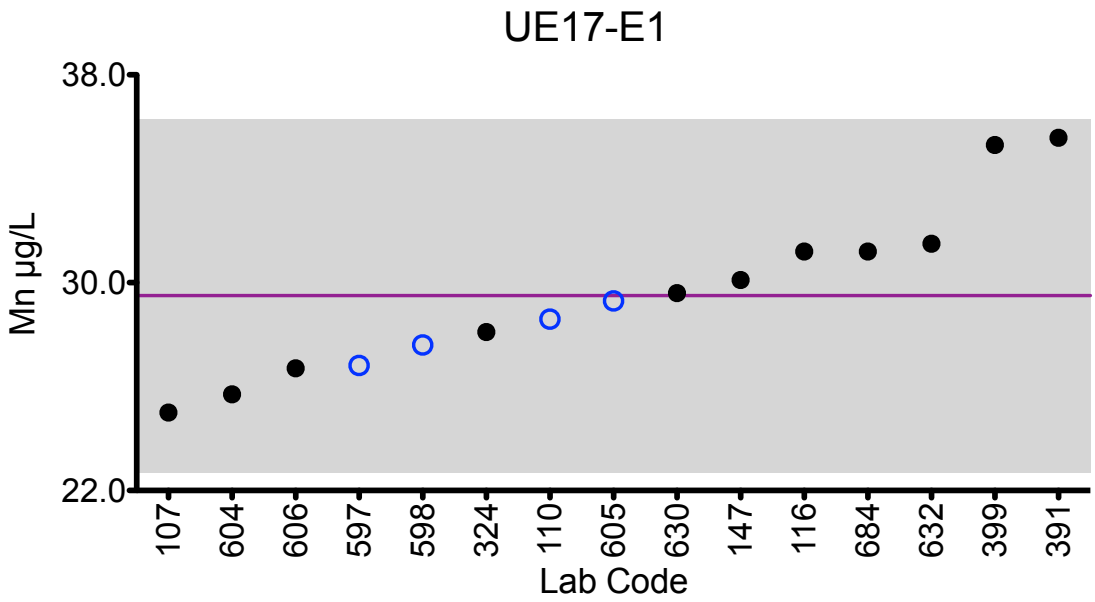
Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Mn (µg/L)

Lab Code	Method	UE17-E1	Lab Code	Method	UE17-E1
107	DRC/CC-ICP-MS	25	598	ICP-MS	27.6
110	DRC/CC-ICP-MS	28.6	604	DRC/CC-ICP-MS	25.7
116	DRC/CC-ICP-MS	31.2	605	ICP-MS	29.3
147	DRC/CC-ICP-MS	30.1	606	DRC/CC-ICP-MS	26.7
324	ICP-MS	28.10	630	ICP-MS	29.6
391	DRC/CC-ICP-MS	35.58	632	DRC/CC-ICP-MS	31.5
399	DRC/CC-ICP-MS	35.3	684	ICP-MS	31.2
597	ICP-MS	26.81			



Mean	29.5
SD	3.4
RSD (%)	11.5
N	14
Standard U	1.08

Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

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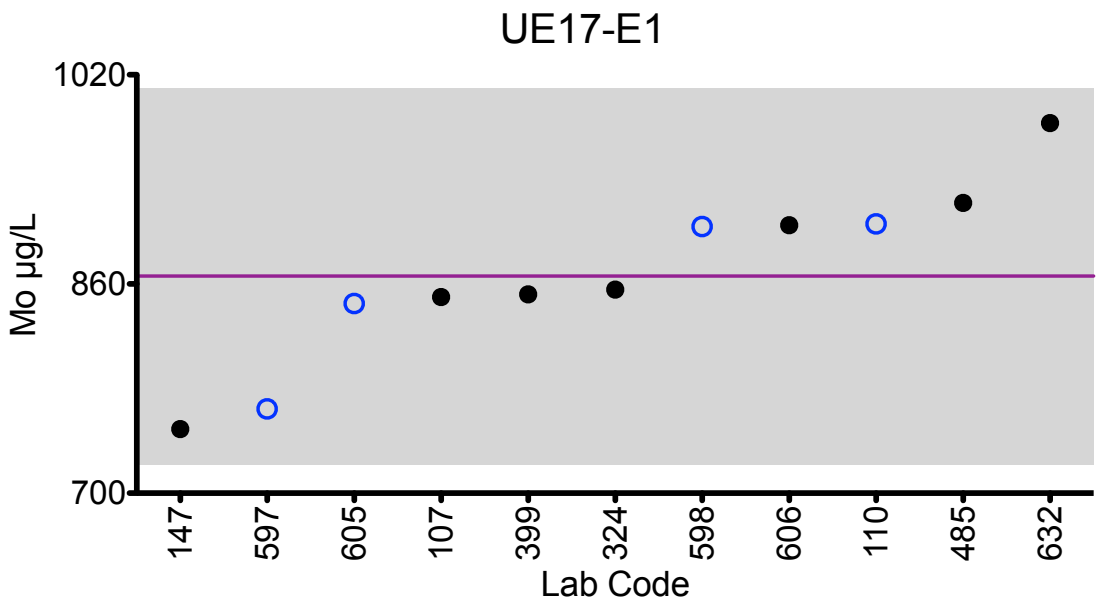
Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Mo (µg/L)

Lab Code	Method	UE17-E1	Lab Code	Method	UE17-E1
107	ICP-MS	850	597	ICP-MS	764.41
110	ICP-MS	906	598	DRC/CC-ICP-MS	904
147	ICP-MS	749	605	ICP-MS	845
324	ICP-MS	855.71	606	ICP-MS	905
399	ICP-MS	852	632	ICP-MS	983
485	HR-ICP-MS	922			



Mean	866
SD	72
RSD (%)	8.3
N	11
Standard U	27.3

Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

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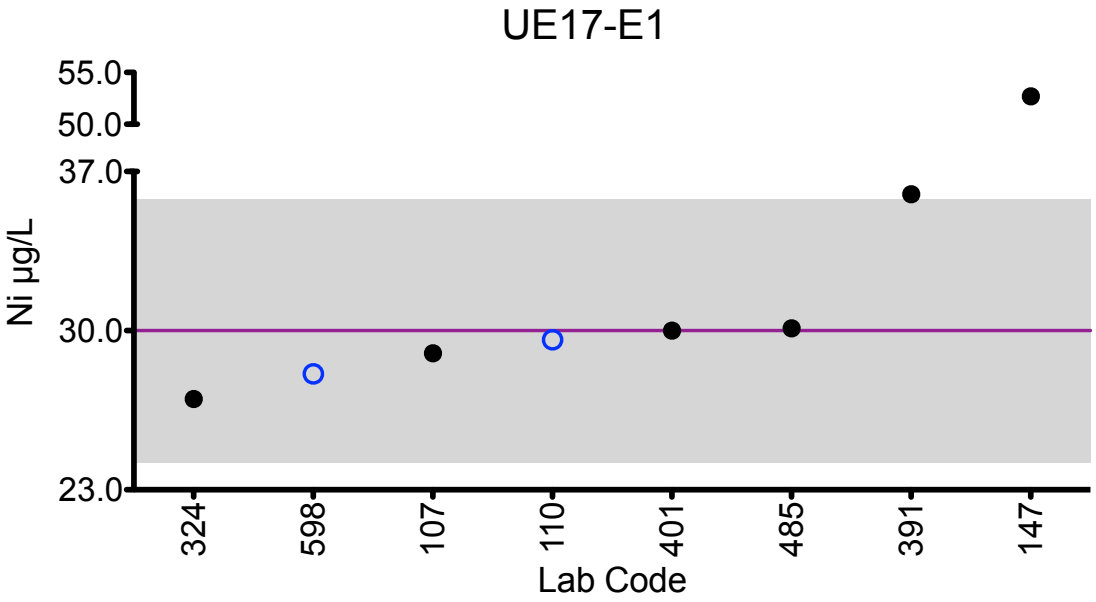
Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Ni (µg/L)

Lab Code	Method	UE17-E1	Lab Code	Method	UE17-E1
107	ICP-MS	29	391	DRC/CC-ICP-MS	36.0
110	ICP-MS	29.6	401	DRC/CC-ICP-MS	30.0
147	DRC/CC-ICP-MS	*52.7	485	HR-ICP-MS	30.1
324	ICP-MS	26.99	598	ICP-MS	28.1



Mean	30.0
SD	2.9
RSD (%)	9.7
N	7
Standard U	NA

Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

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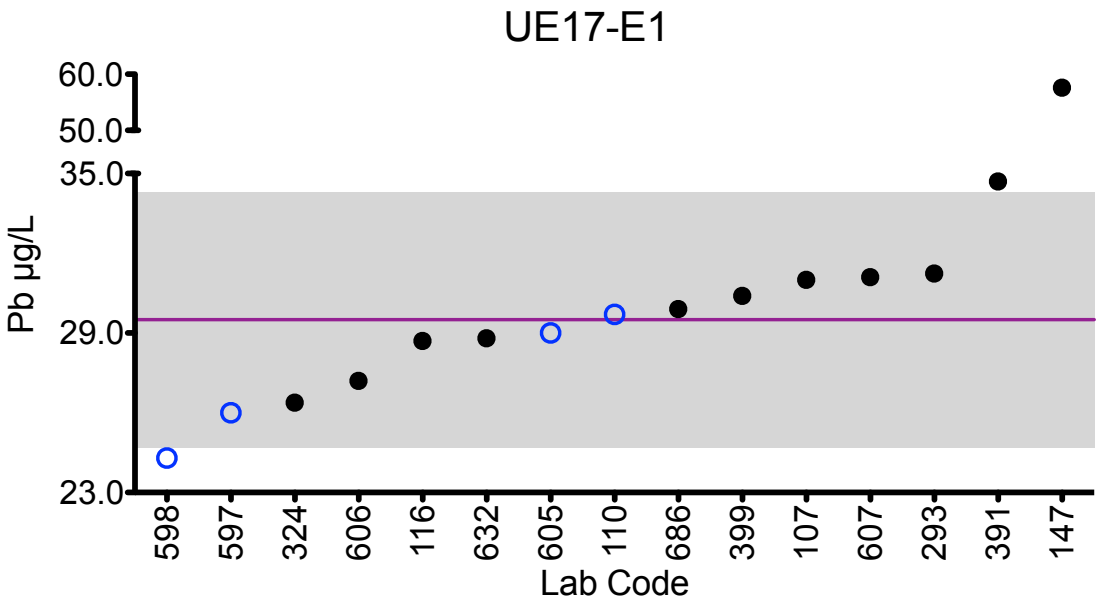
Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Pb (µg/L)

Lab Code	Method	UE17-E1	Lab Code	Method	UE17-E1
107	ICP-MS	31	597	ICP-MS	26
110	ICP-MS	29.7	598	ICP-MS	24.3
116	ICP-MS	28.7	605	ICP-MS	29.0
147	ICP-MS	57.6	606	ICP-MS	27.2
293	DRC/CC-ICP-MS	31.24	607	ICP-MS	31.1
324	ICP-MS	26.38	632	ICP-MS	28.8
391	DRC/CC-ICP-MS	34.7	686	ICP-MS	29.9
399	ICP-MS	30.4			



Mean	29.5
SD	2.4
RSD (%)	8.1
N	15
Standard U	0.78

Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

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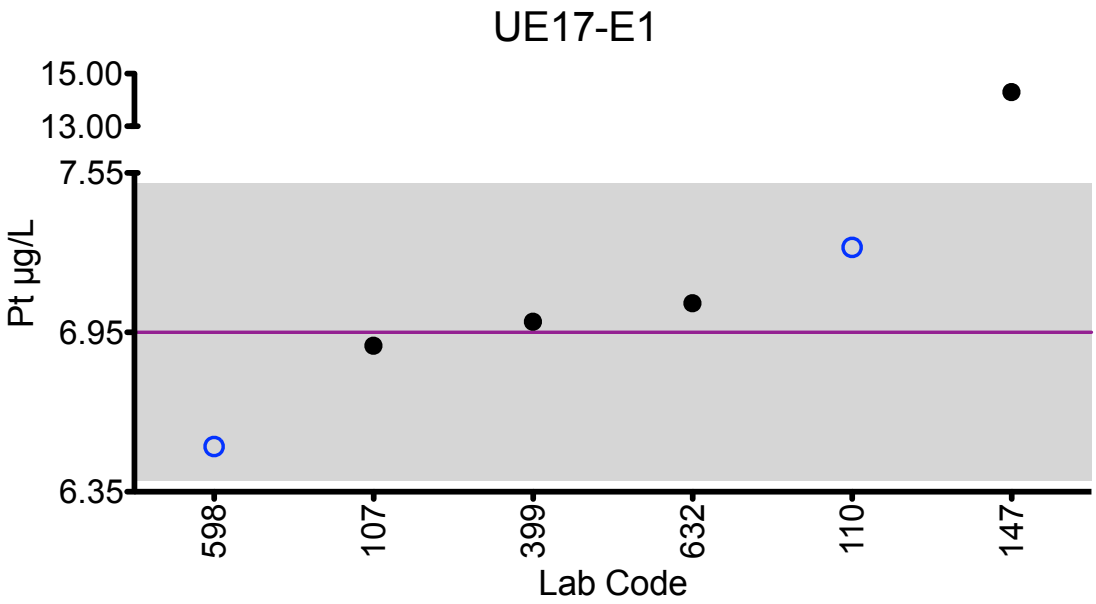
Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Pt (µg/L)					
Lab Code	**Method**	**UE17-E1**	**Lab Code**	**Method**	**UE17-E1**
107	ICP-MS	6.9	399	ICP-MS	6.99
110	ICP-MS	7.27	598	ICP-MS	6.52
147	ICP-MS	*14.3	632	ICP-MS	7.06



Mean	6.95
SD	0.28
RSD (%)	4.0
N	5
Standard U	NA

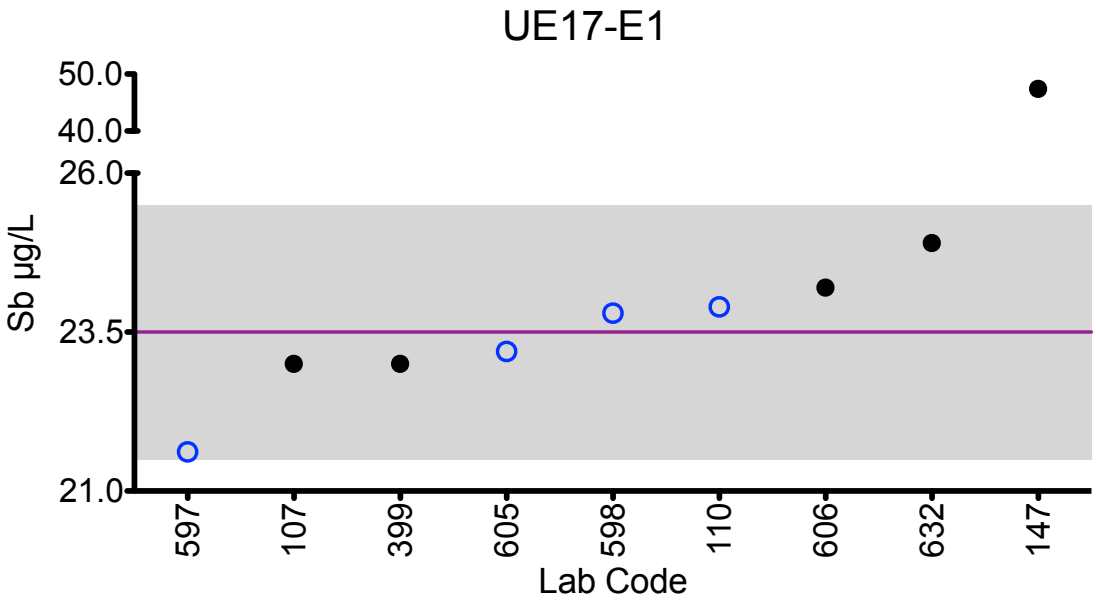
Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Sb (µg/L)					
Lab Code	**Method**	**UE17-E1**	**Lab Code**	**Method**	**UE17-E1**
107	ICP-MS	23	598	ICP-MS	23.8
110	ICP-MS	23.9	605	ICP-MS	23.2
147	ICP-MS	*47.4	606	ICP-MS	24.2
399	ICP-MS	23.0	632	ICP-MS	24.9
597	ICP-MS	21.62			



Mean	23.5
SD	1.0
RSD (%)	4.3
N	8
Standard U	NA

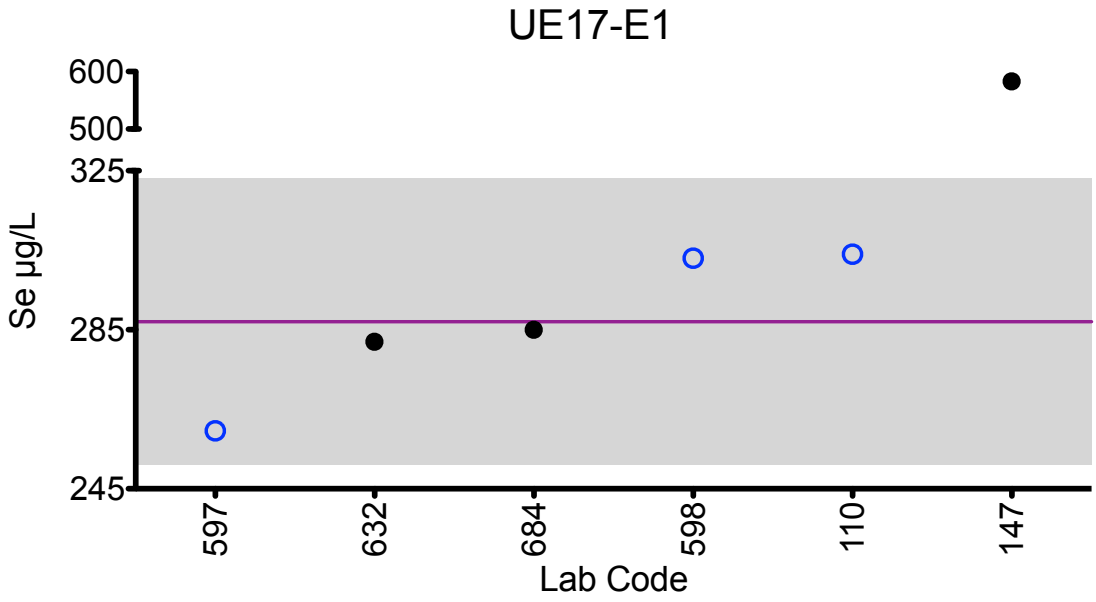
Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Se (µg/L)					
Lab Code	**Method**	**UE17-E1**	**Lab Code**	**Method**	**UE17-E1**
110	DRC/CC-ICP-MS	304	598	DRC/CC-ICP-MS	303
147	ICP-MS	*583	632	DRC/CC-ICP-MS	282
597	ICP-MS	259.6	684	DRC/CC-ICP-MS	285



Mean	287
SD	18
RSD (%)	6.3
N	5
Standard U	NA

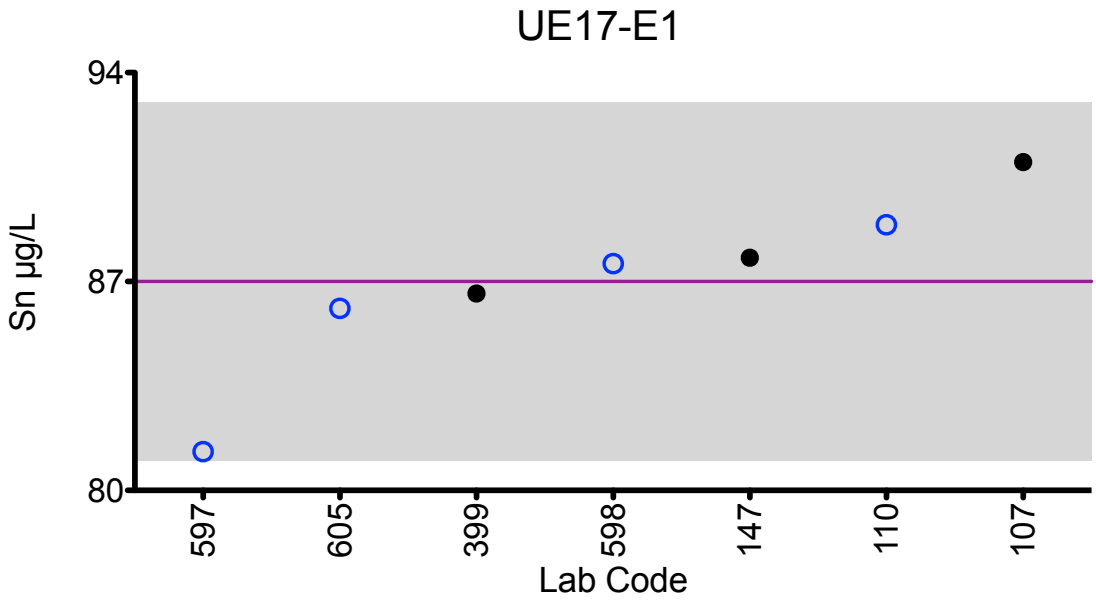
Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Sn (µg/L)					
Lab Code	**Method**	**UE17-E1**	**Lab Code**	**Method**	**UE17-E1**
107	ICP-MS	91	597	ICP-MS	81.3
110	ICP-MS	88.9	598	ICP-MS	87.6
147	ICP-MS	87.8	605	ICP-MS	86.1
399	ICP-MS	86.6			



Mean	87
SD	3
RSD (%)	3.4
N	7
Standard U	NA

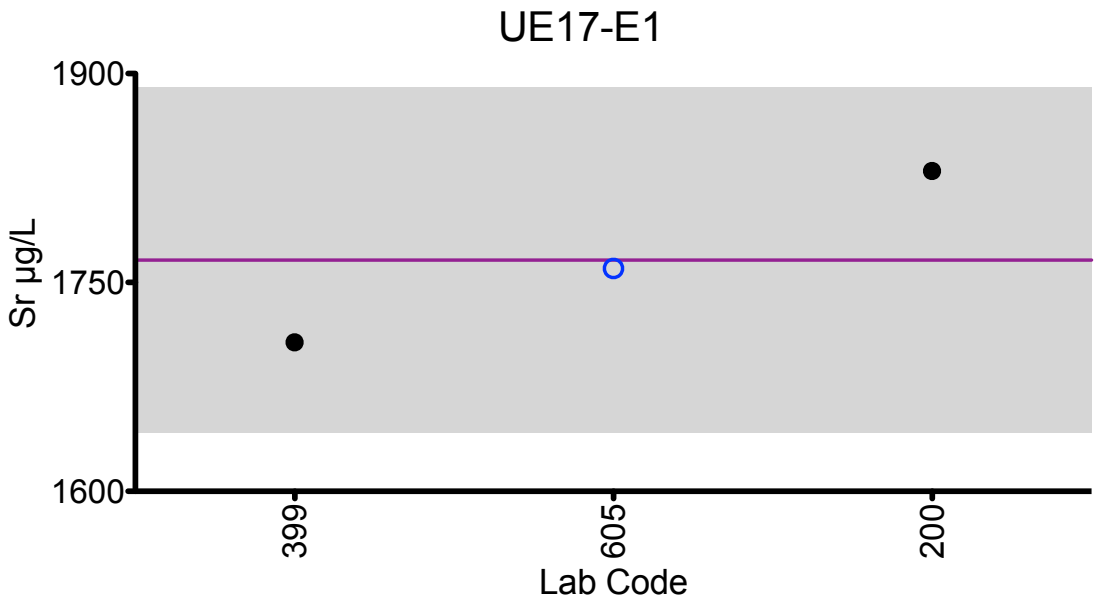
Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Sr (µg/L)					
Lab Code	**Method**	**UE17-E1**	**Lab Code**	**Method**	**UE17-E1**
107	ICP-MS	>1200	399	DRC/CC-ICP-MS	1707
200	ICP-MS	1830.0	605	ICP-MS	1760



Mean	1766
SD	62
RSD (%)	3.5
N	3
Standard U	NA

Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

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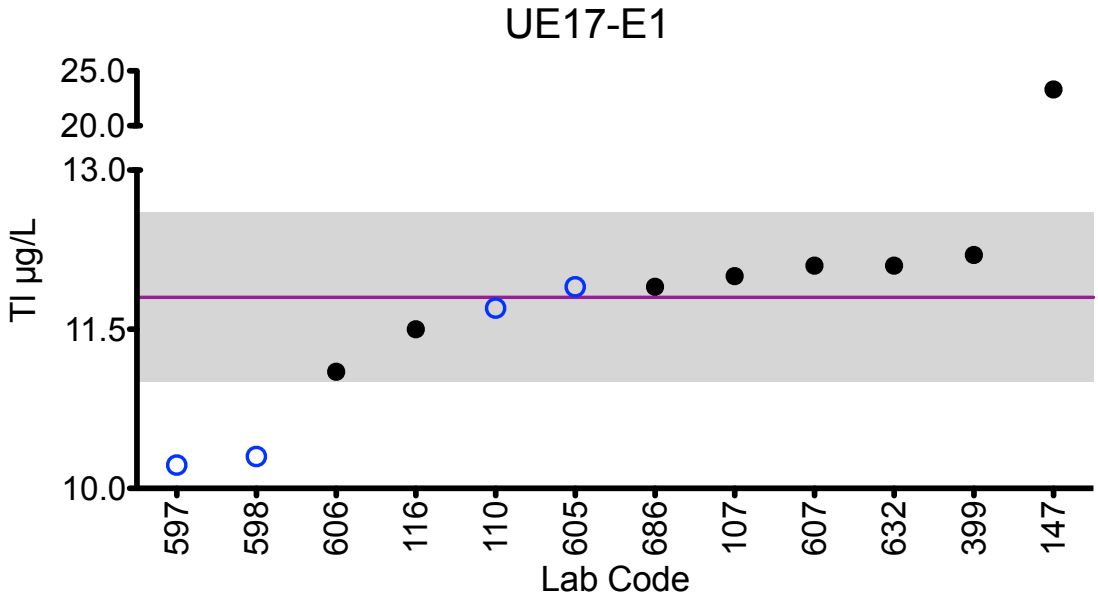
Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Tl (µg/L)

Lab Code	Method	UE17-E1	Lab Code	Method	UE17-E1
107	ICP-MS	12	598	ICP-MS	10.3
110	ICP-MS	11.7	605	ICP-MS	11.9
116	ICP-MS	11.5	606	ICP-MS	11.1
147	ICP-MS	23.3	607	ICP-MS	12.1
399	ICP-MS	12.20	632	ICP-MS	12.1
597	ICP-MS	10.22	686	ICP-MS	11.9



Mean	11.8
SD	0.4
RSD (%)	3.4
N	12
Standard U	0.153

Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

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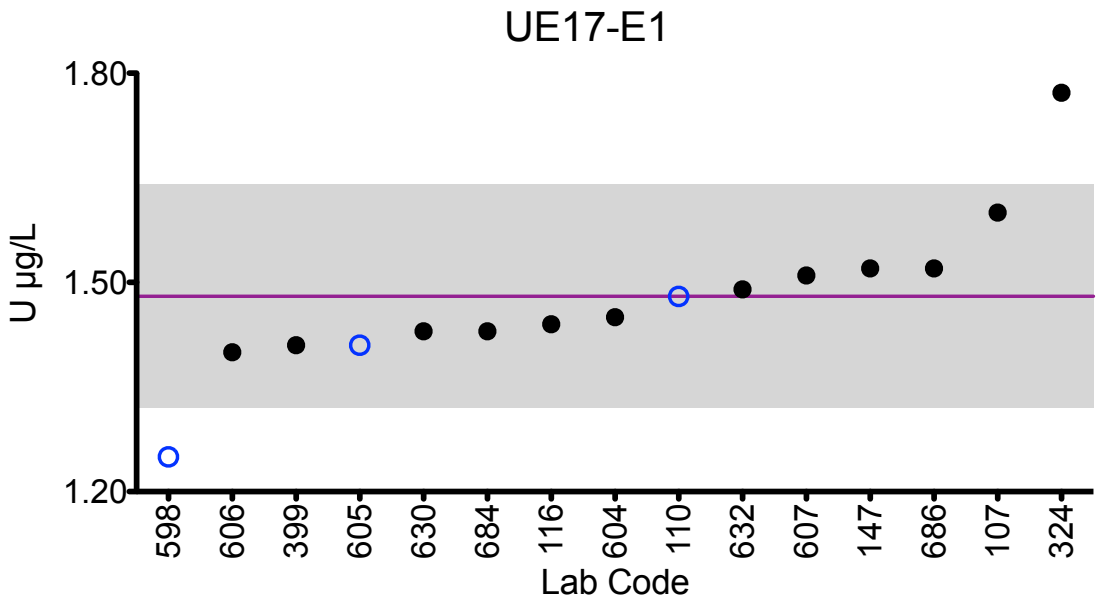
Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine U (µg/L)

Lab Code	Method	UE17-E1	Lab Code	Method	UE17-E1
107	ICP-MS	1.6	605	ICP-MS	1.41
110	ICP-MS	1.48	606	ICP-MS	1.40
116	ICP-MS	1.44	607	ICP-MS	1.51
147	ICP-MS	1.52	630	ICP-MS	1.43
324	ICP-MS	1.772	632	ICP-MS	1.49
399	ICP-MS	1.410	684	ICP-MS	1.43
598	ICP-MS	1.25	686	ICP-MS	1.52
604	ICP-MS	1.45			



Mean	1.48
SD	0.08
RSD (%)	5.4
N	14
Standard U	0.027

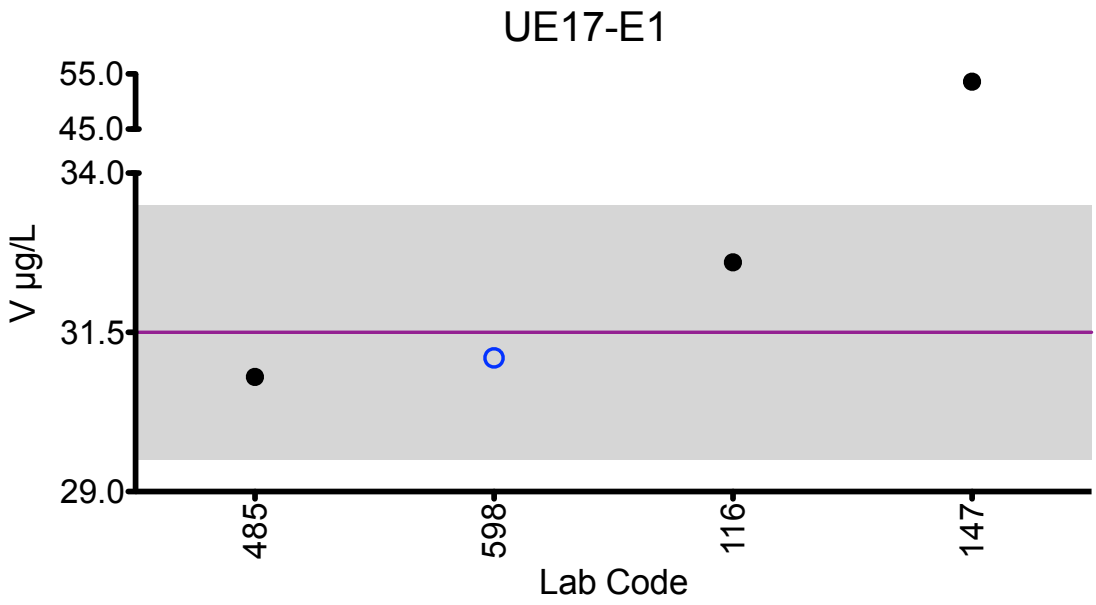
Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine V (µg/L)					
Lab Code	**Method**	**UE17-E1**	**Lab Code**	**Method**	**UE17-E1**
116	DRC/CC-ICP-MS	32.6	485	HR-ICP-MS	30.8
147	DRC/CC-ICP-MS	*53.6	598	DRC/CC-ICP-MS	31.1



Mean	31.5
SD	1.0
RSD (%)	3.2
N	3
Standard U	NA

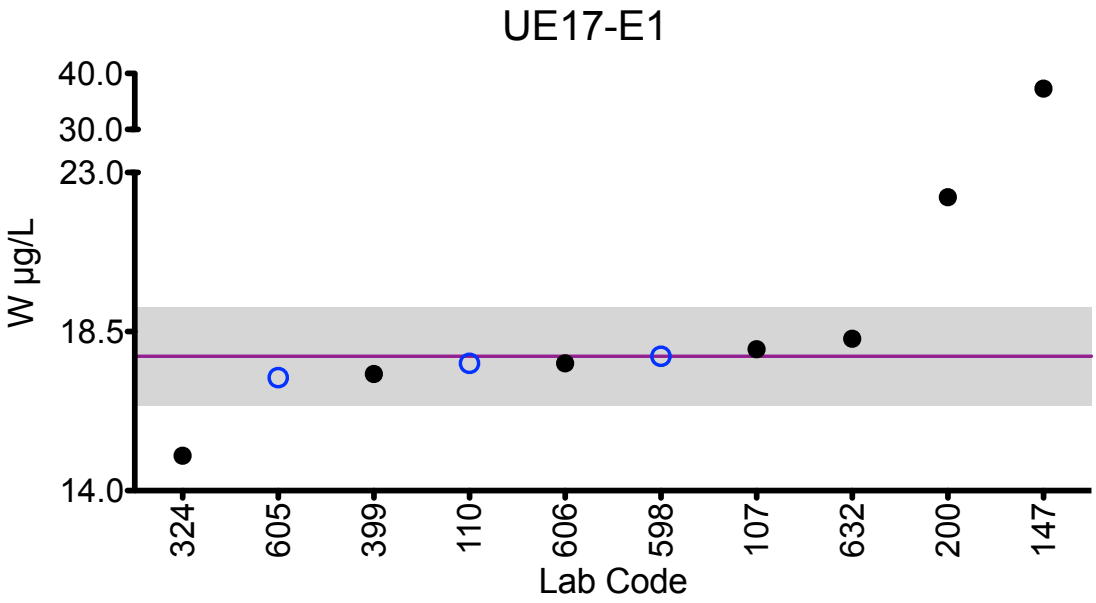
Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine W (µg/L)					
Lab Code	**Method**	**UE17-E1**	**Lab Code**	**Method**	**UE17-E1**
107	ICP-MS	18	399	ICP-MS	17.3
110	ICP-MS	17.6	598	ICP-MS	17.8
147	ICP-MS	37.3	605	ICP-MS	17.2
200	ICP-MS	22.3	606	ICP-MS	17.6
324	ICP-MS	14.99	632	ICP-MS	18.3



Mean	17.8
SD	0.7
RSD (%)	3.9
N	10
Standard U	0.292

Legend:

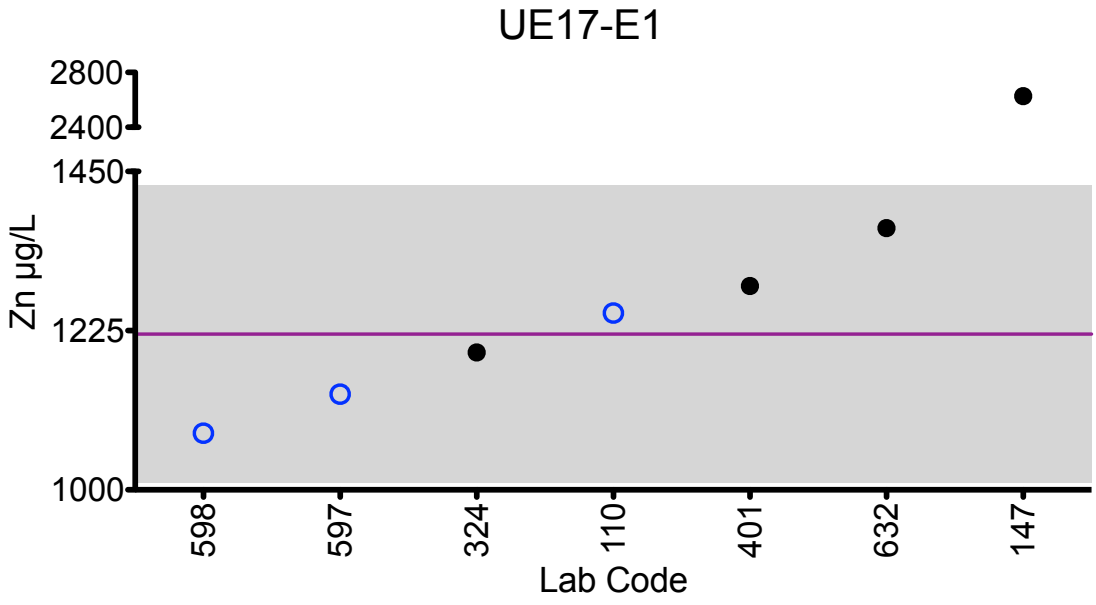
o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

Results for Event #2, 2017:
Educational Urine Sample UE17-E1

Urine Zn (µg/L)

Lab Code	Method	UE17-E1	Lab Code	Method	UE17-E1
110	ICP-MS	1250	597	ICP-MS	1135.23
147	ICP-MS	*2627	598	ICP-MS	1080
324	ICP-MS	1194.26	632	ICP-MS	1370
401	DRC/CC-ICP-MS	1288			



Mean	1220
SD	105
RSD (%)	8.6
N	6
Standard U	NA

Legend:

o CHEAR Labs ● Other Labs
Horizontal purple line = Robust/Arithmetic Mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

Results for Event #2, 2017: Educational Urine Sample UE17-E1

Urine Ag (µg/L)

Lab Code	Method	UE17-E1
147	ICP-MS	< 0.302

Urine B (µg/L)

Lab Code	Method	UE17-E1
200	ICP-MS	594

Urine Bi (µg/L)

Lab Code	Method	UE17-E1
147	ICP-MS	< 0.230

Urine Ca (µg/L)

Lab Code	Method	UE17-E1
598	ICP-AES/OES	25000

Urine Fe (µg/L)

Lab Code	Method	UE17-E1
324	ICP-MS	7.64
598	DRC/CC-ICP-MS	6.45

Urine I (µg/L)

Lab Code	Method	UE17-E1
107	ICP-MS	41

Urine Li (µg/L)

Lab Code	Method	UE17-E1
147	ICP-MS	19.6

Urine Mg (µg/L)

Lab Code	Method	UE17-E1
597	ICP-MS	20982.8

Urine Te (µg/L)

Lab Code	Method	UE17-E1
110	ICP-MS	21.6

Urine Th (µg/L)

Lab Code	Method	UE17-E1
147	ICP-MS	< 0.00557

Urine Ti (µg/L)

Lab Code	Method	UE17-E1
485	HR-ICP-MS	<0.5
598	DRC/CC-ICP-MS	6.3

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Event #2, 2017

Trace Elements in Serum

Wadsworth Center
NEW YORK STATE DEPARTMENT OF HEALTH
Trace Elements Laboratory

Event #2, 2017:
Trace Elements in Serum

PT Materials

Test materials were prepared from human serum obtained from ZenBio, Inc. The company certifies that these materials were tested by FDA approved methods and found to be negative for HIV 1Ž2 and HIV-1 RNA, and non-reactive to HBsAg, HCV3 and STS. Units of serum were filtered into polypropylene containers through cheesecloth to remove particulates and supplemented with aluminum (Al), cobalt (Co), chromium (Cr), copper (Cu), selenium (Se), zinc (Zn), arsenic (As), beryllium (Be), cadmium (Cd), mercury (Hg), manganese (Mn), molybdenum (Mo), nickel (Ni), lead (Pb), platinum (Pt), antimony (Sb), tin (Sn), strontium (Sr), titanium (Ti), thallium (Tl), uranium (U), vanadium (V) and tungsten (W). Serum units were homogenized overnight prior to aliquoting 2-mL into polypropylene vials. PT samples were stored at -80°C until the week of the PT event, when they were thawed at 4°C prior to circulation to laboratories for analysis.

Graded Elements

Six elements in serum are formally graded: Al, Co, Cr, Cu, Se, and Zn. Target values for the graded elements are assigned to these pools based on the arithmetic mean after outlier deletion.

Additional Elements

An additional 29 elements (beyond the six graded) were reported by at least one participant: Ag, As, B, Ba, Be, Bi, Ca, Cd, Cs, Fe, Hg, I, Li, Mg, Mn, Mo, Ni, Pb, Pt, Sb, Sn, Sr, Te, Th, Ti, Tl, U, V, and W. These data are included here to provide a more complete characterization of the PT materials. All results reported by participant laboratories are tabulated and organized by lab code. The PT data are graphed for visual comparison purposes for all elements where at least five laboratories reported a value greater than the LOD. A statistical summary table is provided for samples where at least two comparable values were reported as above the LOD.

The summary statistics for the additional elements are provided for educational purposes only, i.e., no acceptable response is implied. However, it is expected that each laboratory would wish to investigate a potential source of bias if warranted by these data. Future events might result in additional elements becoming graded if a consensus can be reached regarding desired quality specifications.

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Results for Event #2, 2017: Summary Statistics

	Serum Al (µg/L)				
	SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Target (Arithmetic Mean ($\bar{x}$))	34.1	82.1	37.9	207	130
Upper Limit	40.9	98.5	45.5	248.4	156
Lower Limit	27.3	65.7	30.3	165.6	104
Arithmetic SD (s)	3.5	9.4	2.6	10.0	3.0
Arithmetic RSD (%)	10.3	11.4	6.9	4.8	2.3
Number of Sample Measurements (N)	5	5	5	5	5

The acceptable range is based on quality specifications:
±5 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±5 µg/L at concentrations less than or equal to 25 µg/L. These quality specifications were established by New York State Department of Health's Wadsworth Center, the PT Program organizer.

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Results for Event #2, 2017:
Performance of Participating Laboratories

Serum Al (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
	Target	**34.1**	**82.1**	**37.9**	**207**	**130**
147	ETAAS-Z	34.8	78.3	39.4	216	125
293	DRC/CC-ICP-MS	32.65	81.49	35.89	212.63	132.49
391	ETAAS-Z	30.69	72.53	34.44	191.3	133
485	HR-ICP-MS	32.80	80.3	39.2	211	128
598	ICP-MS	39.80	97.8	40.6	203	132

Based on the grading criteria for Al in Serum, 100% of results were satisfactory, with 0 of the 5 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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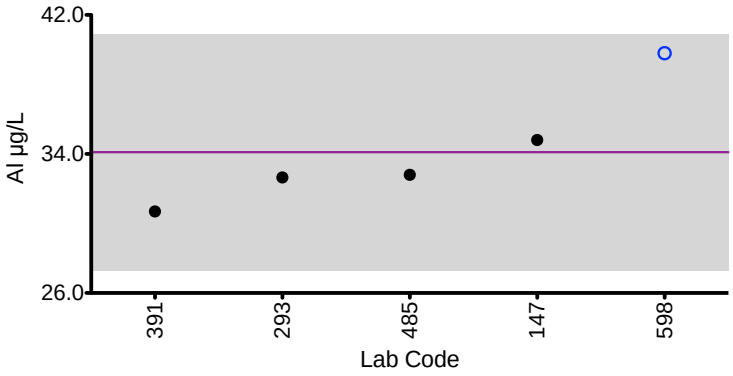
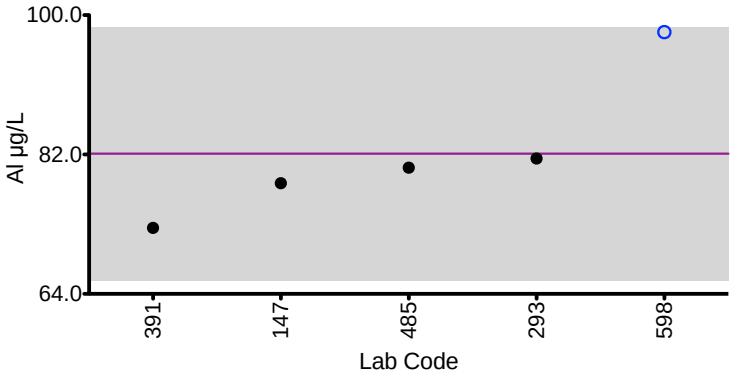
Results for Event #2, 2017: Summary Figures

Serum Al

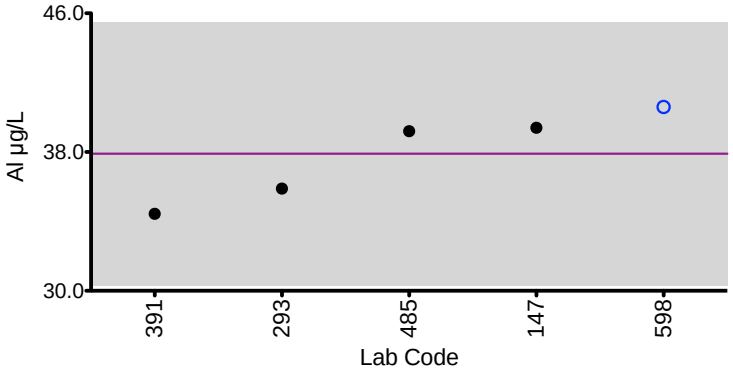
SE17-06



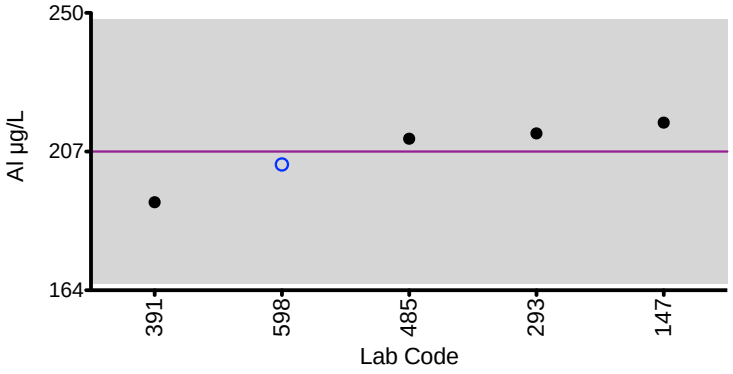
SE17-07



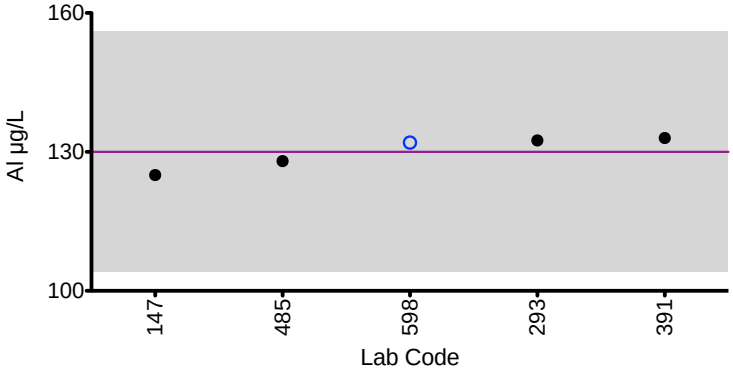
SE17-08



SE17-09



SE17-10



Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the arithmetic mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±5 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±5 µg/L at concentrations less than or equal to 25 µg/L.

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Results for Event #2, 2017: Summary Statistics

Serum Co (µg/L)					
	SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Target (Arithmetic Mean ($\bar{x}$))	1.3	NA	5.4	2.9	9.0
Upper Limit	2.8	NA	6.9	4.4	10.5
Lower Limit	0.0	NA	3.9	1.4	7.5
Arithmetic SD (s)	0.3	NA	2.3	0.3	2.1
Arithmetic RSD (%)	23.1	NA	42.6	10.3	23.3
Number of Sample Measurements (N)	7	NA	7	6	7

The acceptable range is based on quality specifications:
±1.5 µg/L or ±15% around the target value, whichever is greater; thus, it is fixed at ±1.5 µg/L at concentrations less than or equal to 10 µg/L. These quality specifications were established based on discussions with the US FDA, and represent a consensus from a network of Trace Element PT program organizers

Sample SE17-07 was treated as an educational challenge for the purposes of this event, and is not graded. Statistical data were not calculated.

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Results for Event #2, 2017:
Performance of Participating Laboratories

Serum Co (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
	Target	**1.3**	**NA**	**5.4**	**2.9**	**9.0**
103	DRC/CC-ICP-MS	1.27	0.0651	4.39	2.95	8.63
110	ICP-MS	1.37	0.19	4.83	3.13	9.89
147	ICP-MS	1.20	< 0.100	4.05	2.76	7.84
485	HR-ICP-MS	1.28	<0.15	4.56	3.17	8.85
597	ICP-MS	0.85	>0.12	3.29 ↓	2.34	6.87 ↓
598	DRC/CC-ICP-MS	1.14	0.06	9.96 ↑	2.94	7.91
599	DRC/CC-ICP-MS	1.78	<0.1	6.86	*4.35	13.2 ↑

Based on the grading criteria for Co in Serum, 89% of results were satisfactory, with 1 of the 7 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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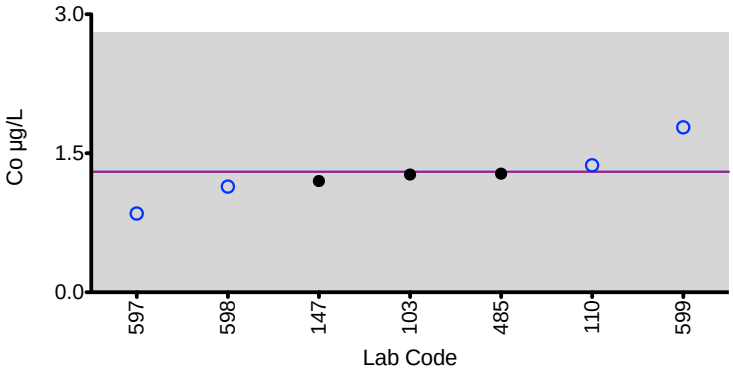
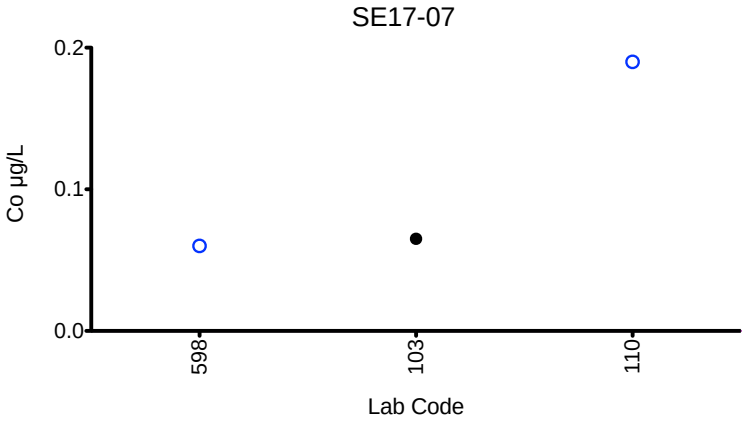
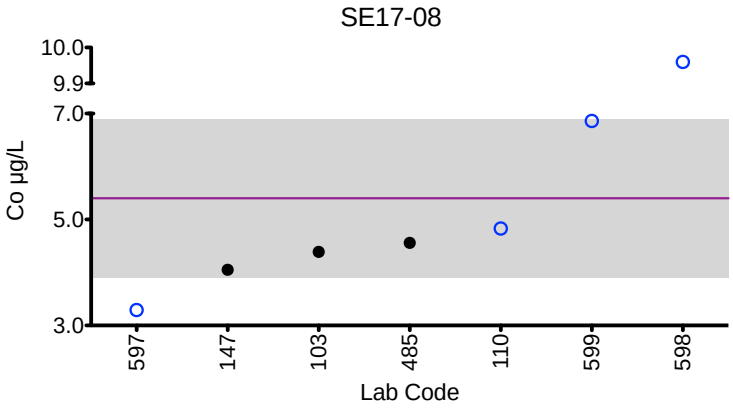
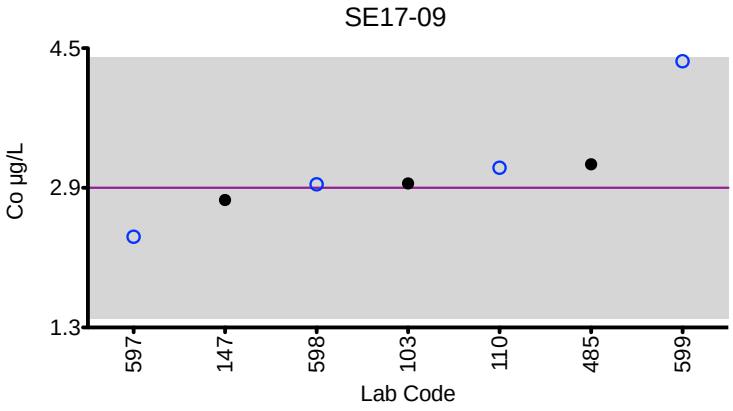
Results for Event #2, 2017: Summary Figures

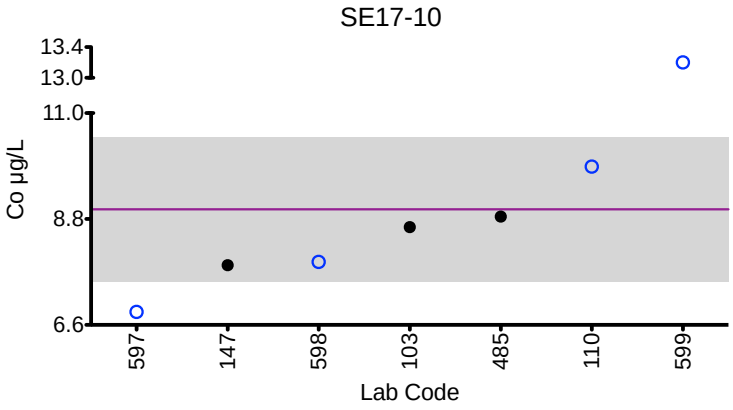
Serum Co











Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the arithmetic mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±1.5 µg/L or ±15% around the target value, whichever is greater; thus, it is fixed at ±1.5 µg/L at concentrations less than or equal to 10 µg/L.

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Results for Event #2, 2017: Summary Statistics

	Serum Cr (µg/L)				
	SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Target (Arithmetic Mean ($\bar{x}$))	7.7	NA	2.2	3.1	NA
Upper Limit	9.7	NA	4.2	5.1	NA
Lower Limit	5.7	NA	0.2	1.1	NA
Arithmetic SD (s)	0.4	NA	0.3	0.3	NA
Arithmetic RSD (%)	5.2	NA	13.6	9.7	NA
Number of Sample Measurements (N)	5	NA	5	5	NA

The acceptable range is based on quality specifications:
±2 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±2 µg/L at concentrations less than or equal to 10 µg/L. These quality specifications were established based on discussions with the US FDA, and represent a consensus from a network of Trace Element PT program organizers

Samples SE17-07 and SE17-10 were treated as an educational challenge for the purposes of this event, and is not graded. Statistical data were not calculated.

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Results for Event #2, 2017:
Performance of Participating Laboratories

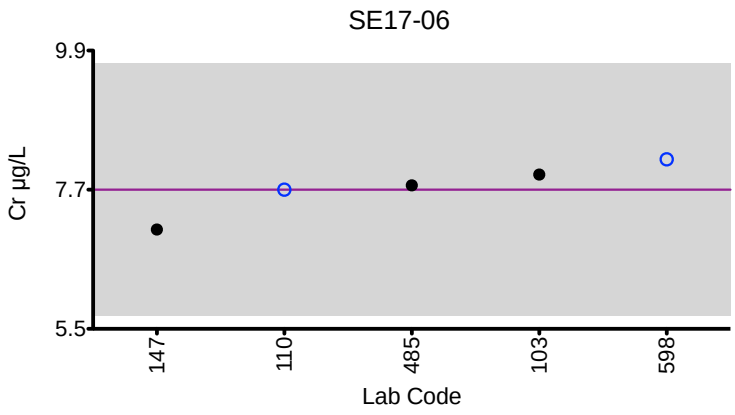
Serum Cr (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
	Target	**7.7**	**NA**	**2.2**	**3.1**	**NA**
103	DRC/CC-ICP-MS	7.94	< 0.500	2.20	3.16	< 0.500
110	DRC/CC-ICP-MS	7.7	< 0.1	2.2	3.2	< 0.1
147	DRC/CC-ICP-MS	7.07	< 0.161	1.81	2.63	< 0.161
485	HR-ICP-MS	7.77	<0.1	2.09	3.09	<0.1
598	DRC/CC-ICP-MS	8.18	0.54	2.75	3.54	1.00

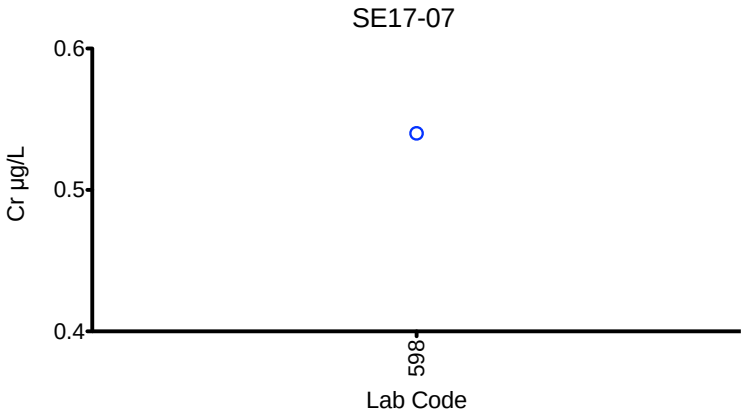
Based on the grading criteria for Cr in Serum, 100% of results were satisfactory, with 0 of the 5 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

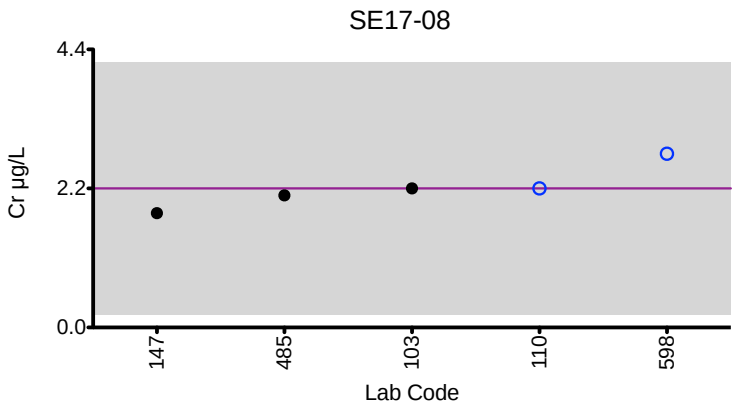
* Denotes a statistical Outlier

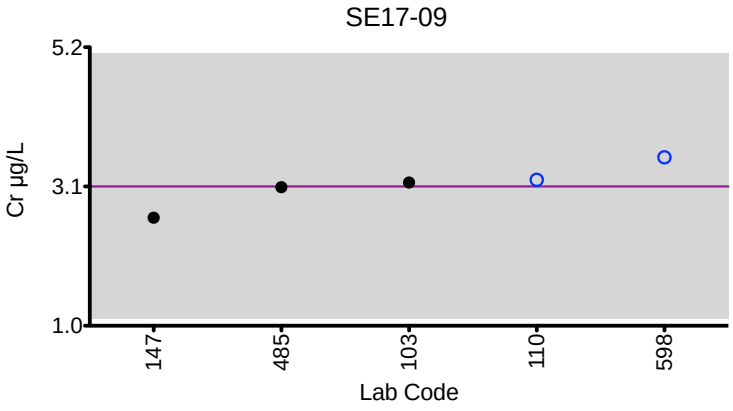
Results for Event #2, 2017:
Summary Figures

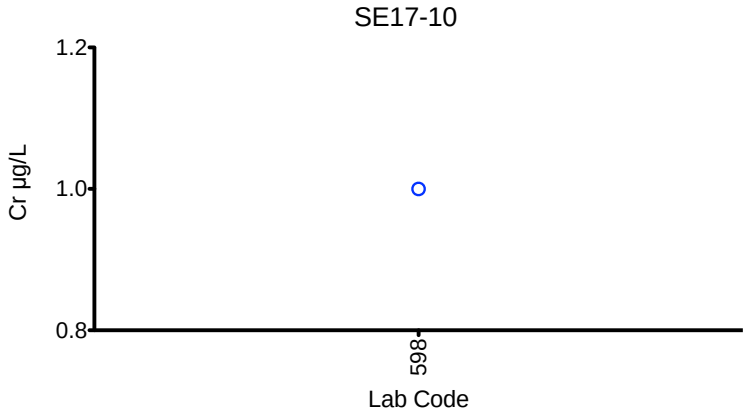
Serum Cr











Legend:
o C/HHEAR Labs ● Other Labs
Horizontal purple line = assigned target value based on the arithmetic mean of all laboratories.
Gray area = acceptable range based on quality specifications:
±2 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±2 µg/L at concentrations less than or equal to 10 µg/L.

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Results for Event #2, 2017:
Summary Statistics

Serum Cu (µg/L)					
	SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Target (Arithmetic Mean ($\bar{x}$))	2974	1866	900	511	1579
Upper Limit	3420	2146	1035	606	1816
Lower Limit	2528	1586	765	416	1342
Arithmetic SD (s)	327	260	124	56	194
Arithmetic RSD (%)	11.0	13.9	13.8	11.0	12.3
Number of Sample Measurements (N)	9	9	9	9	9

The acceptable range is based on quality specifications:
±95 µg/L or ±15% around the target value, whichever is greater; thus, it is fixed at ±95 µg/L at concentrations less than or equal to 635 µg/L. These quality specifications were established by New York State Department of Health's Wadsworth Center, the PT Program organizer.

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Results for Event #2, 2017:
Performance of Participating Laboratories

		Serum Cu (µg/L)				
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
	Target	**2974**	**1866**	**900**	**511**	**1579**
107	DRC/CC-ICP-MS	3000	1900	900	520	1500
110	ICP-MS	3000	1910	933	525	1610
147	ICP-MS	2694	1626	781	448	1391
293	DRC/CC-ICP-MS	2961.86	1861.41	895.1	518.12	1614.11
457	ICP-AES/OES	3036	1944	946	563	1692
483	DRC/CC-ICP-MS	3040	1880	897	517	1570
597	ICP-MS	2462.88 ↓	1491.56 ↓	723.61 ↓	416.90	1331.79 ↓
598	DRC/CC-ICP-MS	2890	1750	850	488	1500
599	DRC/CC-ICP-MS	3680 ↑	2430 ↑	1170 ↑	603	2000 ↑

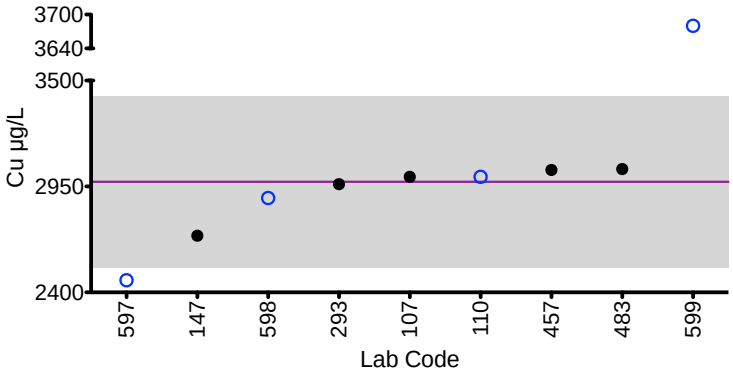
Based on the grading criteria for Cu in Serum, 82% of results were satisfactory, with 2 of the 9 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

NEW YORK STATE Department of Health | Wadsworth Center

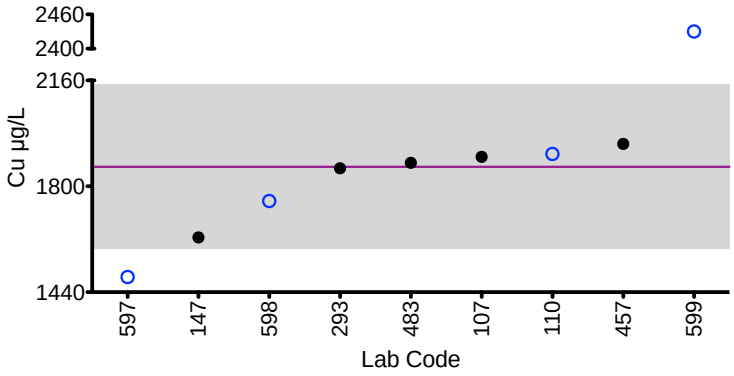
Results for Event #2, 2017: Summary Figures

Serum Cu

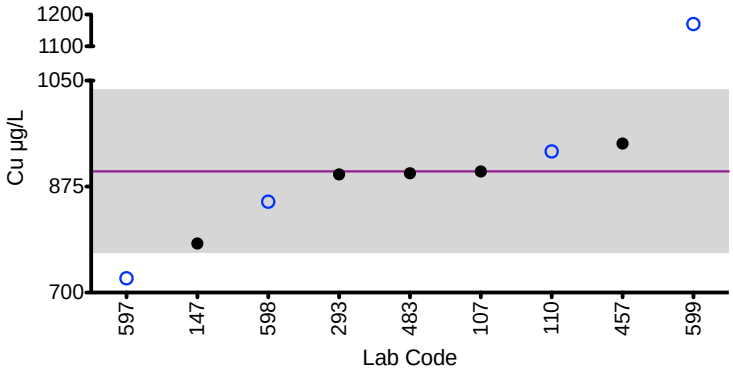
SE17-06



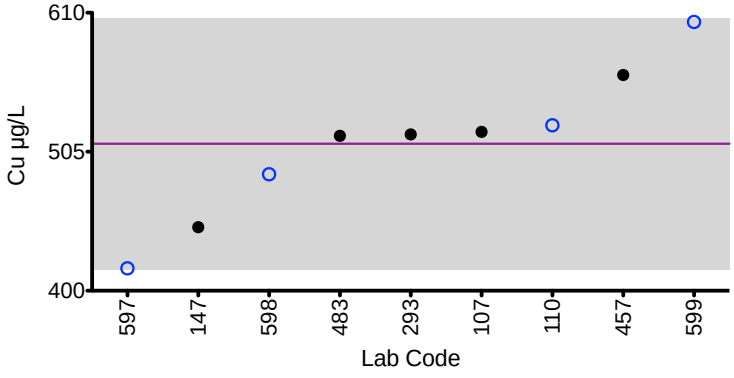
SE17-07



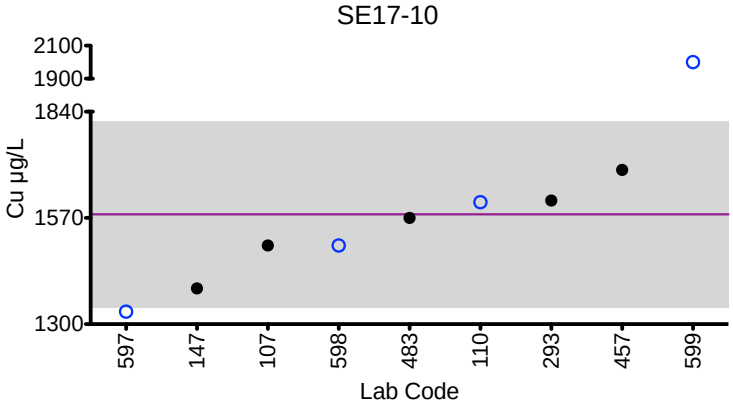
SE17-08



SE17-09



SE17-10



Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the arithmetic mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±95 µg/L or ±15% around the target value, whichever is greater; thus, it is fixed at ±95 µg/L at concentrations less than or equal to 635 µg/L.

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Results for Event #2, 2017:
Summary Statistics

	Serum Se (µg/L)				
	SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Target (Arithmetic Mean ($\bar{x}$))	288	112	136	144	224
Upper Limit	346	134	163	173	269
Lower Limit	230	90	109	115	179
Arithmetic SD (s)	30	16	12	20	32
Arithmetic RSD (%)	10.4	14.3	8.8	13.9	14.3
Number of Sample Measurements (N)	9	9	8	9	9

The acceptable range is based on quality specifications:
±2 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±2 µg/L at concentrations less than or equal to 10 µg/L. These quality specifications were established by New York State Department of Health's Wadsworth Center, the PT Program organizer.

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Results for Event #2, 2017:
Performance of Participating Laboratories

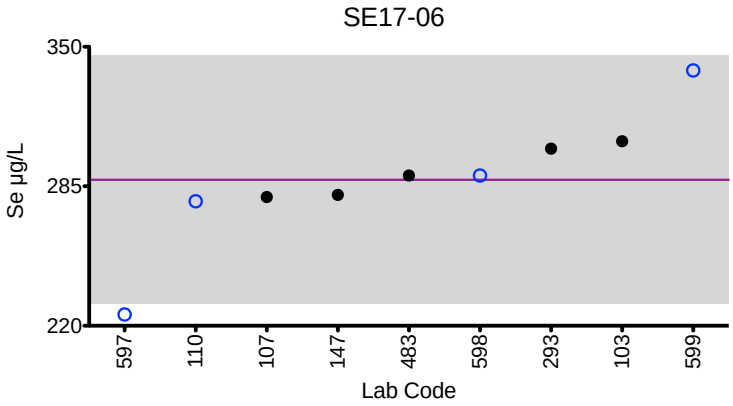
		Serum Se (µg/L)				
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
	Target	**288**	**112**	**136**	**144**	**224**
103	DRC/CC-ICP-MS	306	116	147	157	238
107	DRC/CC-ICP-MS	280	110	130	140	200
110	DRC/CC-ICP-MS	278	107	139	135	213
147	ICP-MS	281	107	132	128	209
293	DRC/CC-ICP-MS	302.53	115.32	147.71	153.24	240.92
483	DRC/CC-ICP-MS	290	113	141	144	224
597	ICP-MS	225.24 ↓	86.33 ↓	109.91	112.17 ↓	177.55 ↓
598	DRC/CC-ICP-MS	290	107	141	143	223
599	DRC/CC-ICP-MS	339	147 ↑	*195 ↑	185 ↑	293 ↑

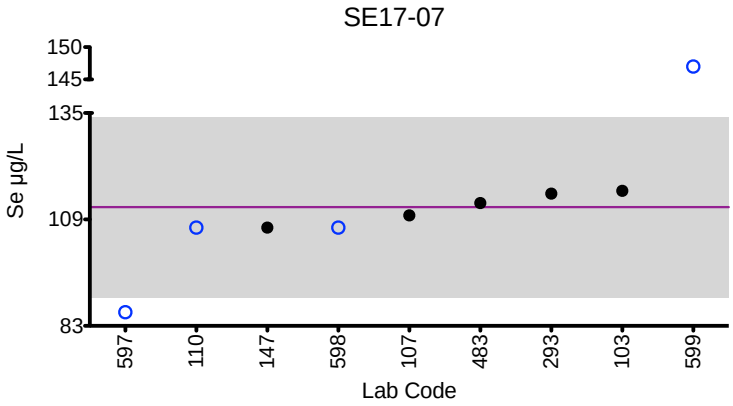
Based on the grading criteria for Se in Serum, 82% of results were satisfactory, with 2 of the 9 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

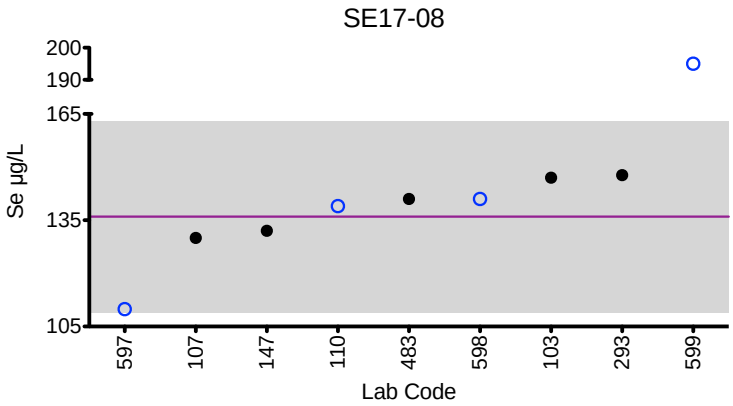
NEW YORK STATE Department of Health | Wadsworth Center

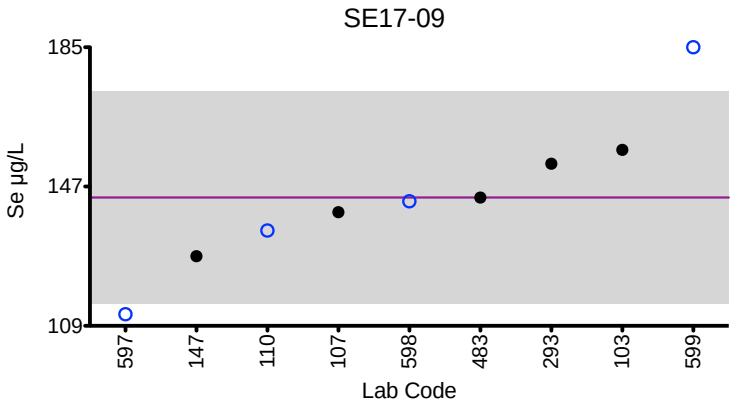
Results for Event #2, 2017: Summary Figures

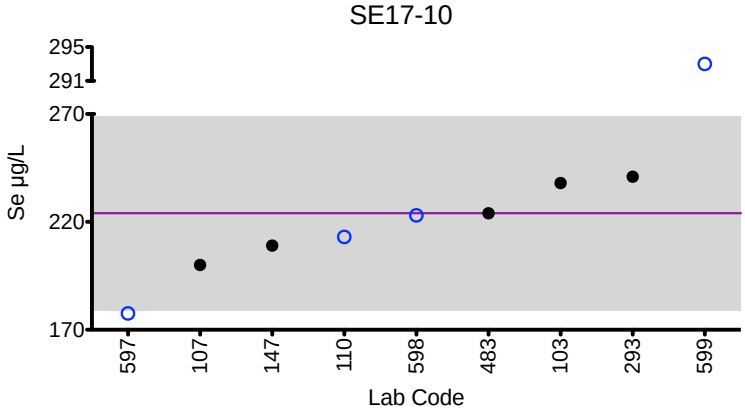
Serum Se











Legend:

○ C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the arithmetic mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±2 µg/L or ±20% around the target value, whichever is greater; thus, it is fixed at ±2 µg/L at concentrations less than or equal to 10 µg/L.

Results for Event #2, 2017:
Summary Statistics

Serum Zn (µg/L)					
	SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Target (Arithmetic Mean ($\bar{x}$))	1360	1258	916	1461	557
Upper Limit	1564	1447	1053	1680	641
Lower Limit	1156	1069	779	1242	473
Arithmetic SD (s)	170	184	139	197	40
Arithmetic RSD (%)	12.5	14.6	15.2	13.5	7.2
Number of Sample Measurements (N)	9	9	9	9	8

The acceptable range is based on quality specifications:
±15 µg/L or ±15% around the target value, whichever is greater; thus, it is fixed at ±15 µg/L at concentrations less than or equal to 100 µg/L. These quality specifications were established by New York State Department of Health's Wadsworth Center, the PT Program organizer.

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Results for Event #2, 2017:
Performance of Participating Laboratories

Serum Zn (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
	Target	**1360**	**1258**	**916**	**1461**	**557**
107	DRC/CC-ICP-MS	1500	1400	1000	1700 ↑	610
110	ICP-MS	1380	1280	919	1480	573
147	ICP-MS	1261	1118	810	1294	512
293	DRC/CC-ICP-MS	1368.63	1282.35	950.98	1547.06	605.23
457	ICP-AES/OES	1175	1093	787	1296	531
483	DRC/CC-ICP-MS	1380	1280	914	1410	563
597	ICP-MS	1117.60 ↓	1052.25 ↓	759.62 ↓	1195.60 ↓	503.82
598	ICP-MS	1370	1170	887	1430	557
599	DRC/CC-ICP-MS	1690 ↑	1650 ↑	1220 ↑	1800 ↑	*726 ↑

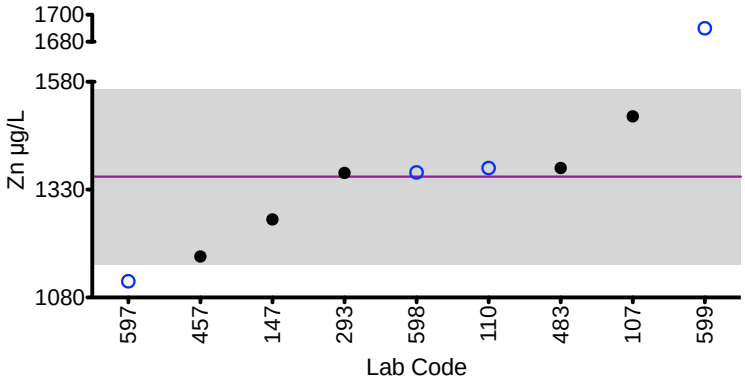
Based on the grading criteria for Zn in Serum, 78% of results were satisfactory, with 2 of the 9 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

NEW YORK STATE Department of Health | Wadsworth Center

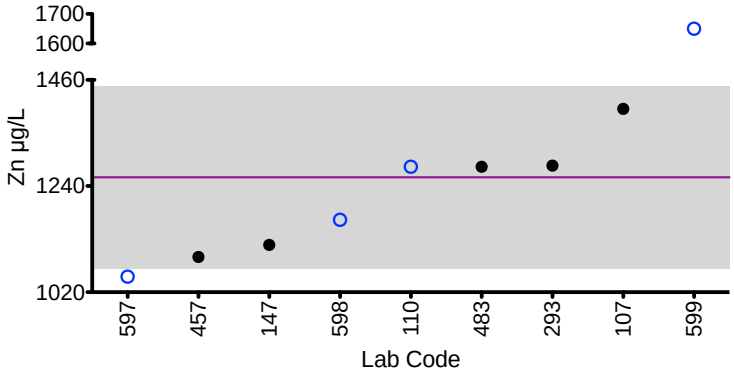
Results for Event #2, 2017: Summary Figures

Serum Zn

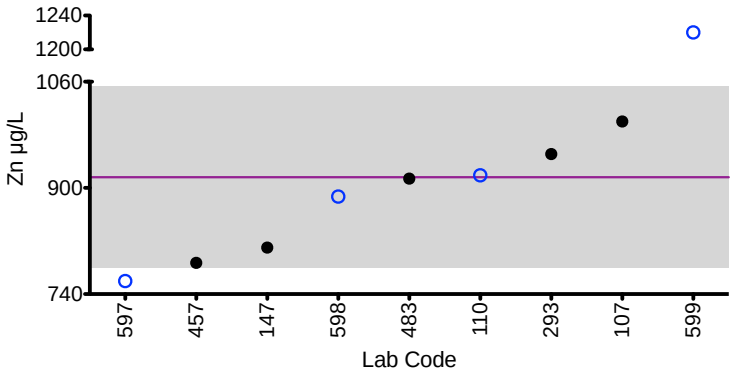
SE17-06



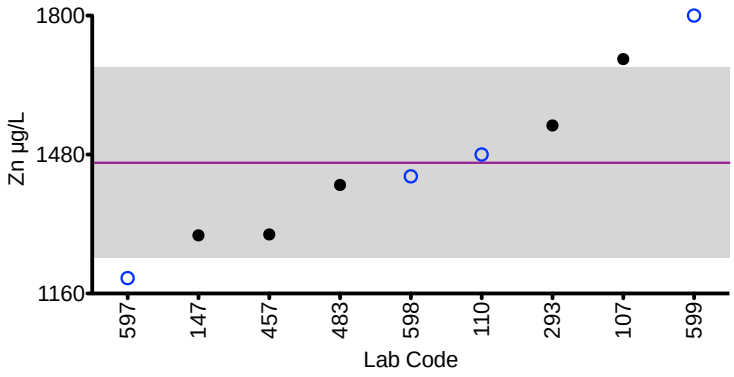
SE17-07



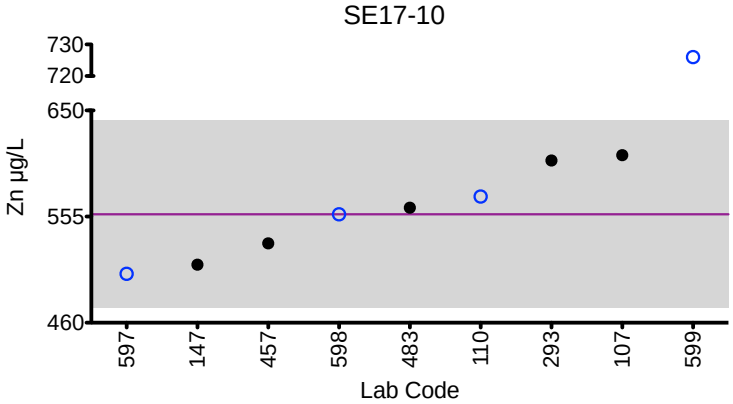
SE17-08



SE17-09



SE17-10



Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = assigned target value based on the arithmetic mean of all laboratories.

Gray area = acceptable range based on quality specifications:

±15 µg/L or ±15% around the target value, whichever is greater; thus, it is fixed at ±15 µg/L at concentrations less than or equal to 100 µg/L.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum As (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
103	DRC/CC-ICP-MS	14.8	12.4	1.70	4.08	7.23
110	DRC/CC-ICP-MS	13.0	10.9	1.7	3.8	6.7
147	ICP-MS	12.20	9.59	< 0.899	2.20	5.26
597	ICP-MS	11.2	9.27	1.49	3.50	6.14
598	DRC/CC-ICP-MS	14.4	12.2	2.05	4.31	7.12
599	DRC/CC-ICP-MS	14.4	13.2	1.43	3.57	6.99
Summary Statistics						
		SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)		13.3	11.3	1.7	3.6	6.6
Arithmetic SD (s)		1.4	1.6	0.2	0.7	0.8
Arithmetic RSD (%)		10.5	14.2	11.8	19.4	12.1
Number of Sample Measurements (N)		6	6	5	6	6

*Denotes a statistical Outlier.

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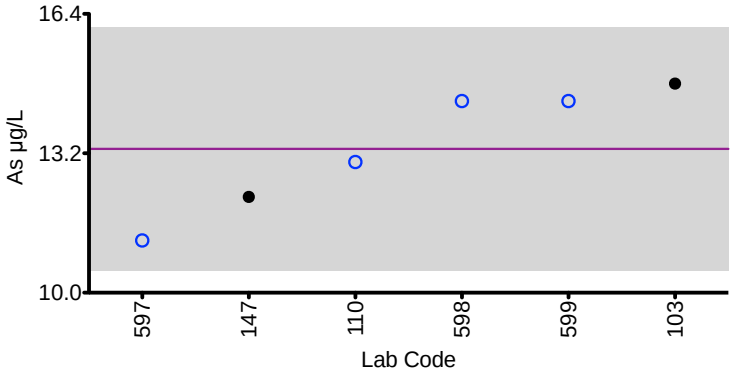
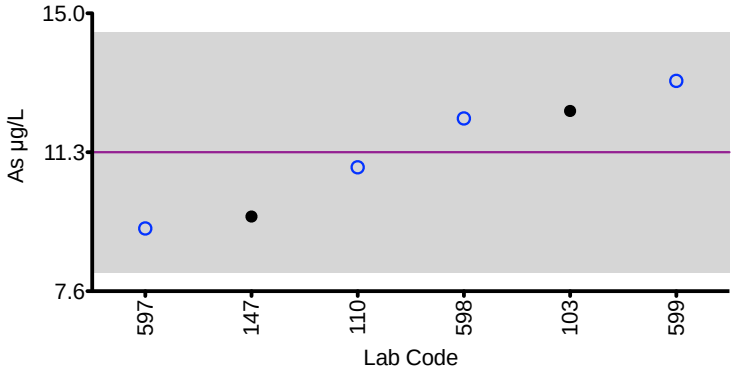
Results for Event #2, 2017: Summary Figures

Serum As

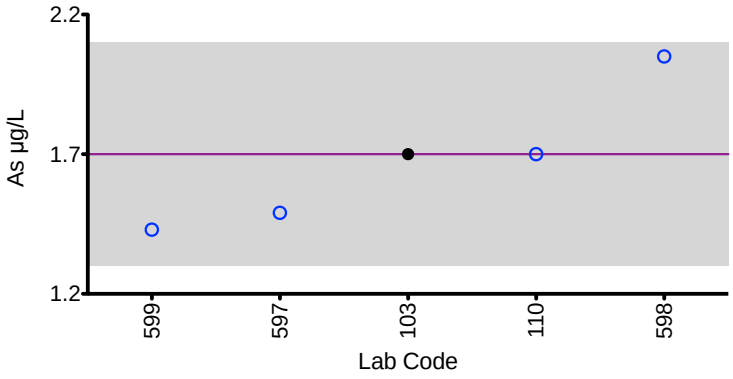
SE17-06



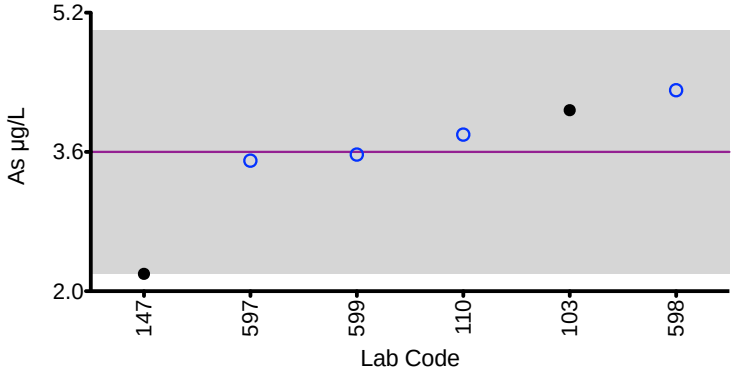
SE17-07



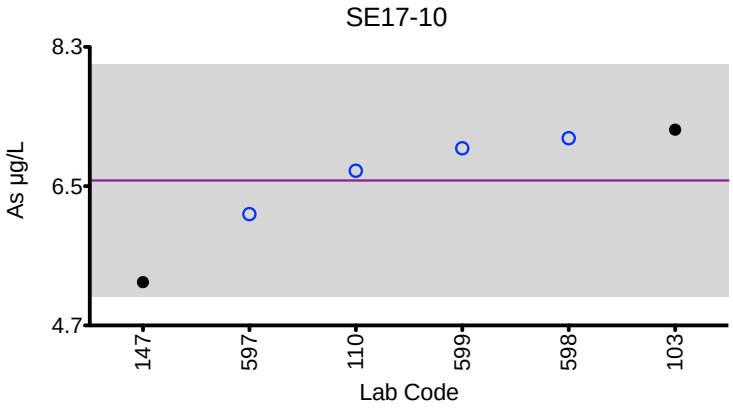
SE17-08



SE17-09



SE17-10



Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = arithmetic mean of all laboratories.

Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum Cd (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
103	DRC/CC-ICP-MS	0.998	0.285	3.65	4.77	1.72
110	ICP-MS	0.96	0.35	3.78	4.95	1.72
147	ICP-MS	0.861	0.263	3.28	4.30	1.53
597	ICP-MS	0.80	0.37	3.19	3.93	1.58
598	ICP-MS	0.79	0.20	3.57	4.51	1.65
599	DRC/CC-ICP-MS	1.17	0.42	*5.64	*6.65	*2.17
Summary Statistics						
		SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)		0.93	0.31	3.5	4.5	1.6
Arithmetic SD (s)		0.14	0.08	0.3	0.4	0.1
Arithmetic RSD (%)		15.1	25.8	8.6	8.9	6.3
Number of Sample Measurements (N)		6	6	5	5	5

*Denotes a statistical Outlier.

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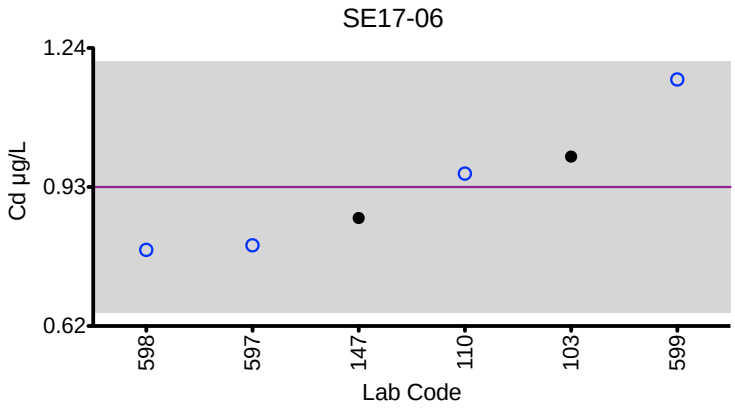
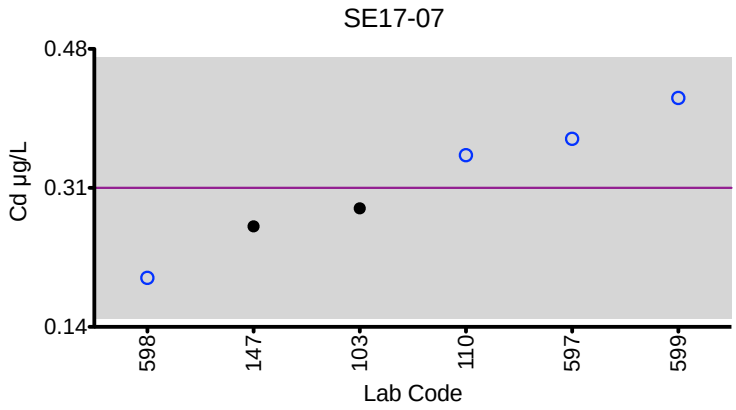
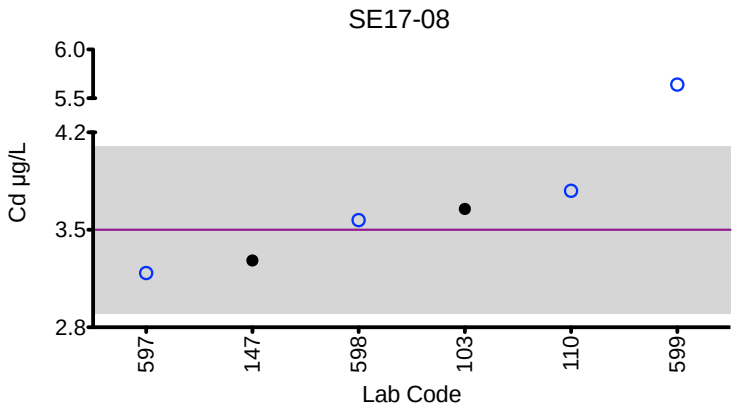
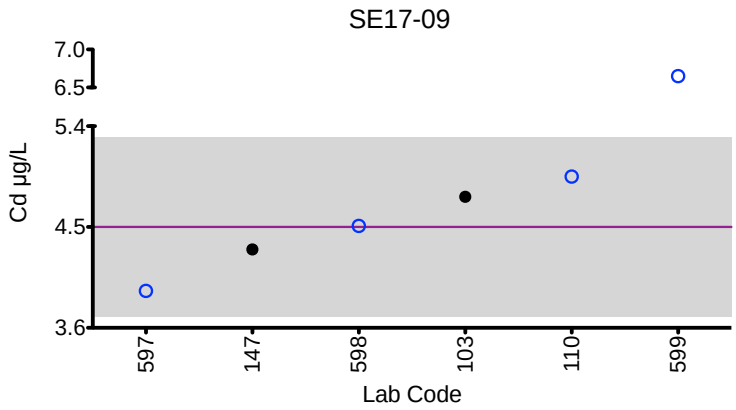
Results for Event #2, 2017: Summary Figures

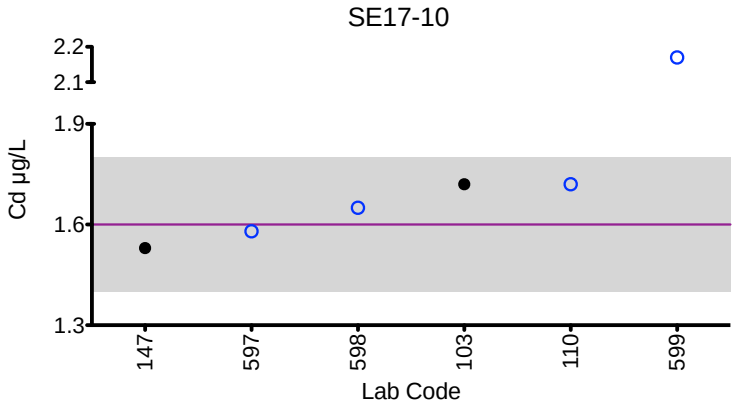
Serum Cd











Legend:
o C/HHEAR Labs ● Other Labs
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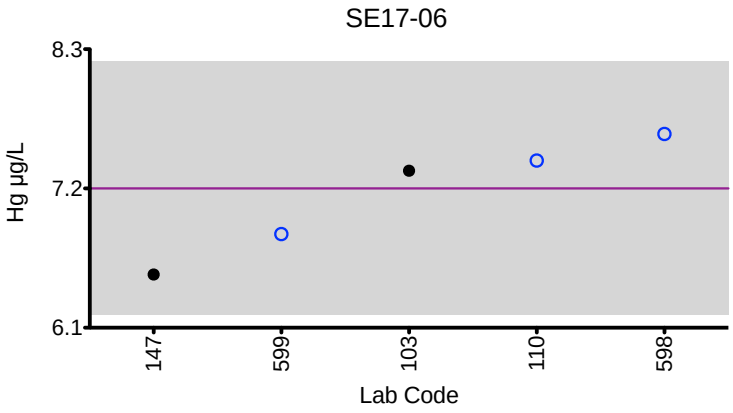
Results for Event #2, 2017:
Laboratory Data and Summary Statistics

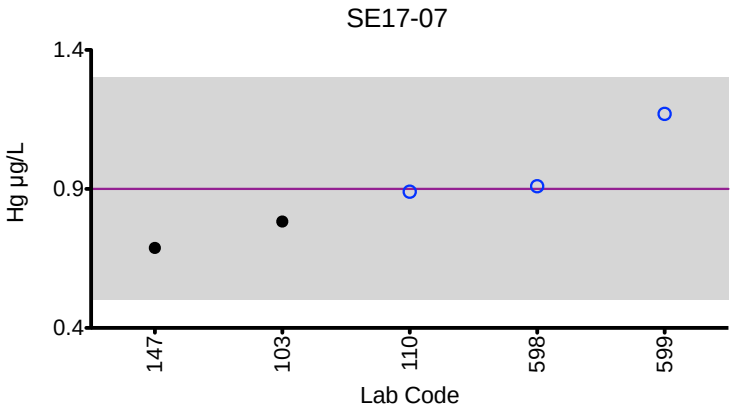
Serum Hg (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
103	DRC/CC-ICP-MS	7.34	0.783	2.49	1.67	1.39
110	ICP-MS	7.42	0.89	2.56	1.78	1.42
147	ICP-MS	6.52	0.688	2.10	1.53	1.30
598	ICP-MS	7.63	0.91	2.73	1.84	1.56
599	DRC/CC-ICP-MS	6.84	1.17	2.95	2.08	1.42
Summary Statistics						
		SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)		7.2	0.9	2.6	1.8	1.4
Arithmetic SD (s)		0.5	0.2	0.3	0.2	0.1
Arithmetic RSD (%)		6.9	22.2	11.5	11.1	7.1
Number of Sample Measurements (N)		5	5	5	5	5

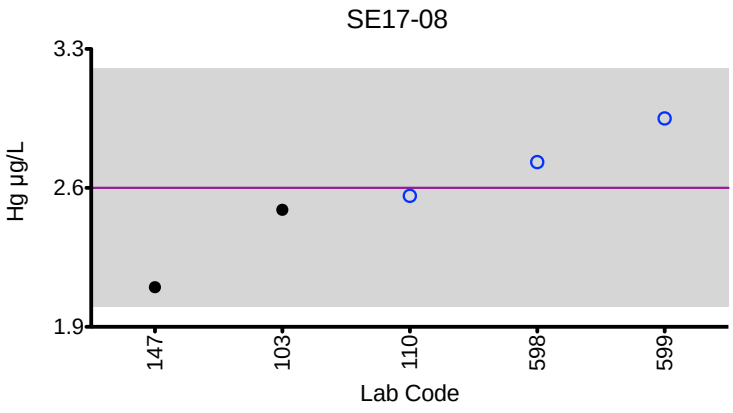
*Denotes a statistical Outlier.

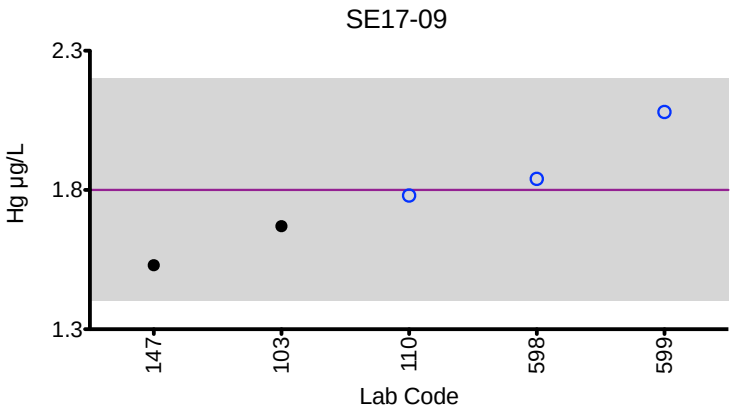
Results for Event #2, 2017:
Summary Figures

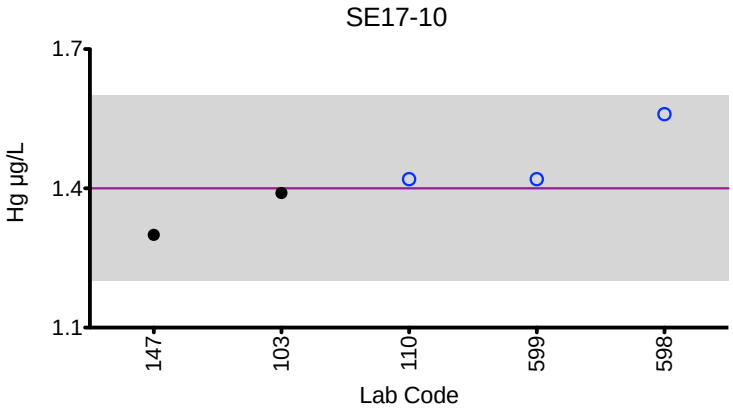
Serum Hg











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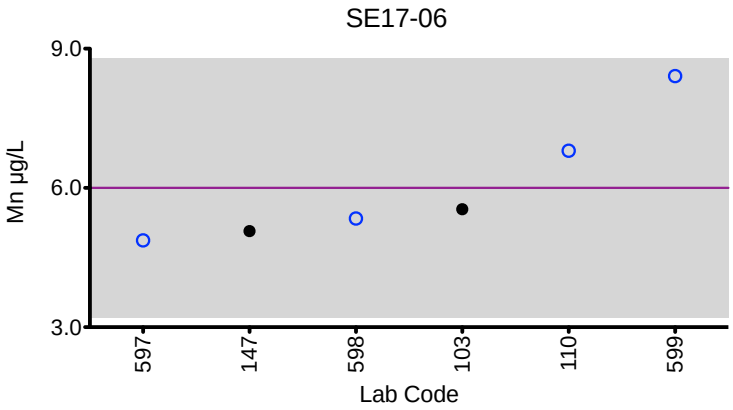
Results for Event #2, 2017:
Laboratory Data and Summary Statistics

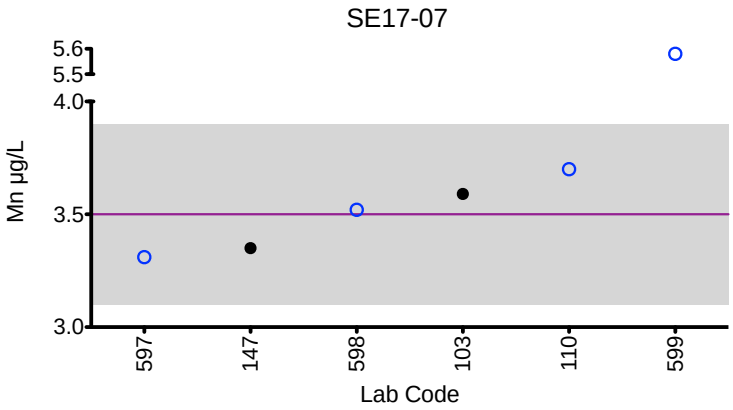
Serum Mn (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
103	DRC/CC-ICP-MS	5.54	3.59	10.6	0.668	6.74
110	ICP-MS	6.8	3.7	10.8	1.1	6.6
147	ICP-MS	5.07	3.35	9.51	0.857	5.88
597	ICP-MS	4.87	3.31	8.94	1.12	6.00
598	ICP-MS	5.34	3.52	10.9	0.85	6.55
599	DRC/CC-ICP-MS	8.41	*5.58	*18.0	1.10	*10.8
Summary Statistics						
		SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)		6.0	3.5	10.2	0.95	6.4
Arithmetic SD (s)		1.4	0.2	0.9	0.19	0.4
Arithmetic RSD (%)		23.3	5.7	8.8	20.0	6.3
Number of Sample Measurements (N)		6	5	5	6	5

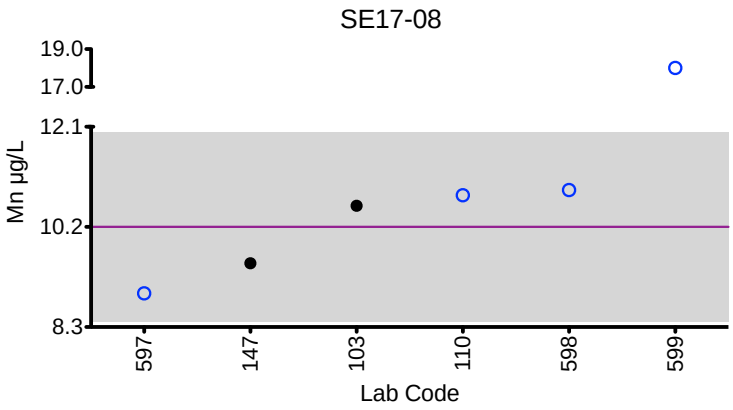
*Denotes a statistical Outlier.

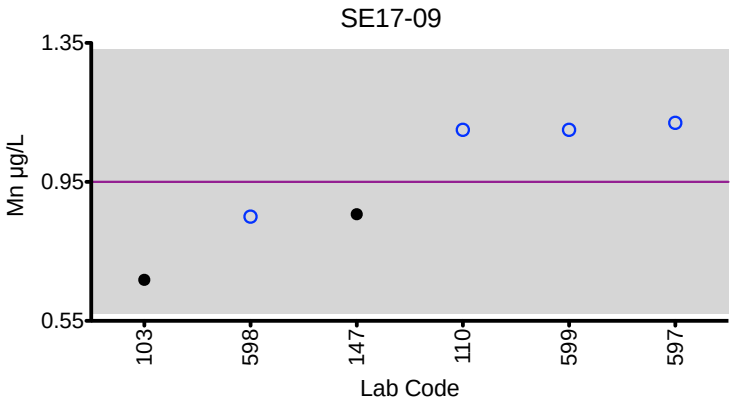
Results for Event #2, 2017:
Summary Figures

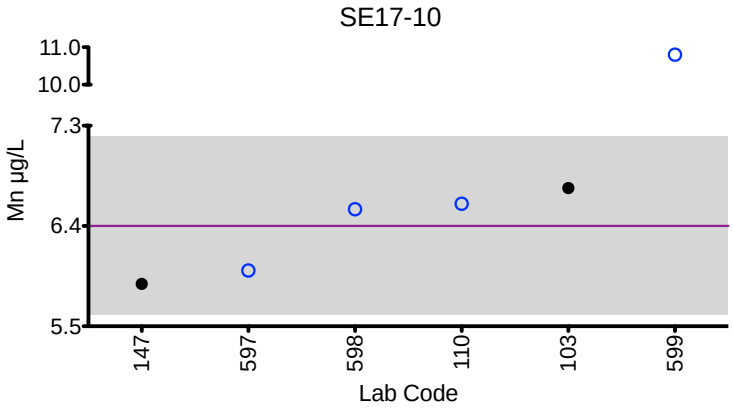
Serum Mn











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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum Mo (µg/L)

Lab Code	Method	SE17-06	SE17-07	SE17-08	SE17-09	SE17-10
103	DRC/CC-ICP-MS	6.61	5.76	3.20	1.80	3.10
110	ICP-MS	5.5	6.2	4.0	2.6	*4.6
147	ICP-MS	4.61	4.68	2.67	1.43	2.54
485	HR-ICP-MS	5.23	5.52	3.09	1.83	3.03
597	ICP-MS	4.06	4.31	2.44	1.44	2.39
598	ICP-MS	5.60	5.85	2.95	2.25	3.06
599	DRC/CC-ICP-MS	5.20	5.98	3.76	1.87	3.30

Summary Statistics

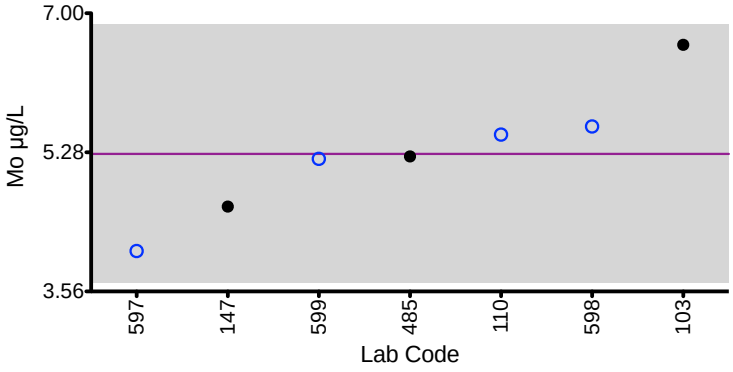
	SE17-06	SE17-07	SE17-08	SE17-09	SE17-10
Arithmetic Mean ($\bar{x}$)	5.26	5.47	3.16	1.89	2.90
Arithmetic SD (s)	0.80	0.71	0.56	0.42	0.36
Arithmetic RSD (%)	15.2	13.0	17.7	22.2	12.4
Number of Sample Measurements (N)	7	7	7	7	6

*Denotes a statistical Outlier.

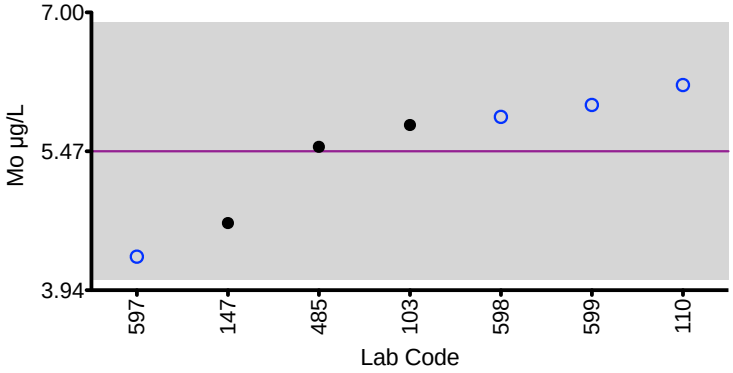
Results for Event #2, 2017:
Summary Figures

Serum Mo

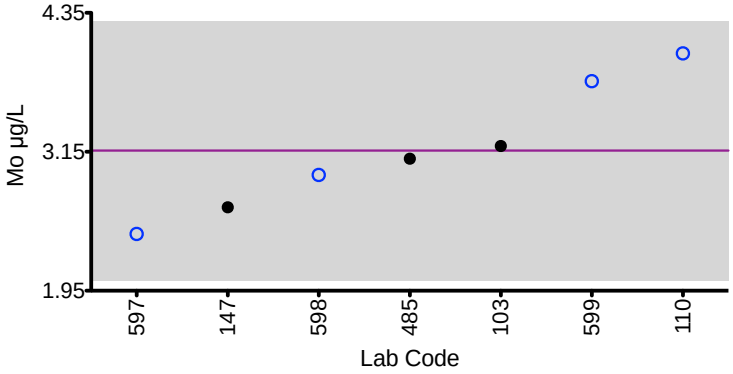
SE17-06



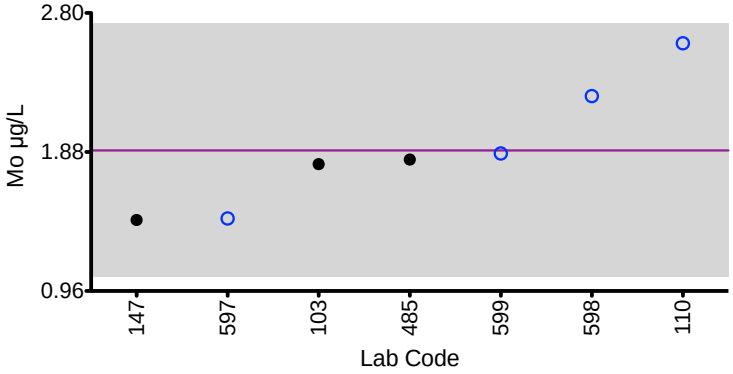
SE17-07



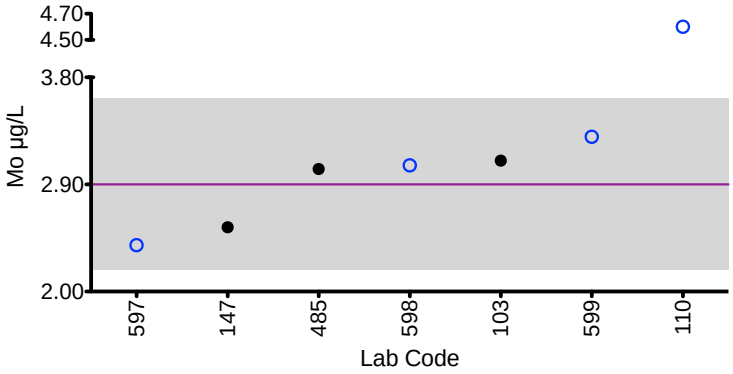
SE17-08



SE17-09



SE17-10



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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum Ni (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
110	DRC/CC-ICP-MS	4.0	7.3	1.7	12.5	4.3
147	ICP-MS	3.86	7.16	1.70	11.5	4.75
485	HR-ICP-MS	4.47	7.51	1.26	12.4	4.11
598	DRC/CC-ICP-MS	6.49	7.76	1.96	12.7	4.5
599	DRC/CC-ICP-MS	4.72	*10.4	1.92	*16.1	5.71
Summary Statistics						
		SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)		4.7	7.4	1.7	12.3	4.7
Arithmetic SD (s)		1.1	0.3	0.3	0.5	0.6
Arithmetic RSD (%)		23.4	4.1	17.6	4.1	12.8
Number of Sample Measurements (N)		5	4	5	4	5

*Denotes a statistical Outlier.

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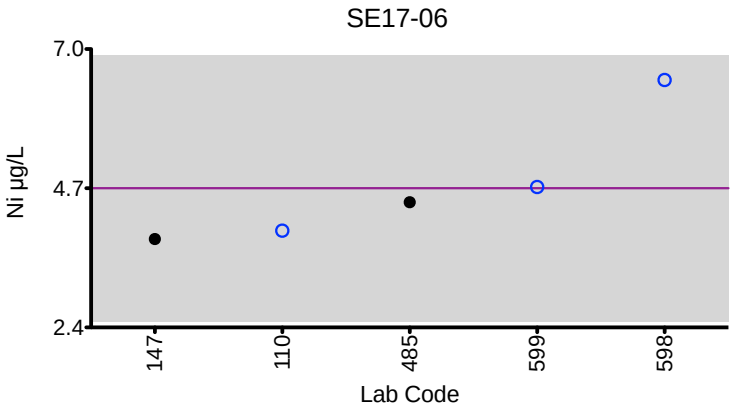
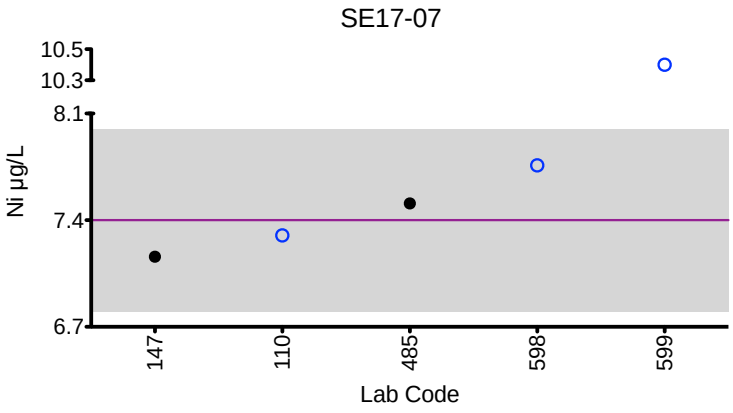
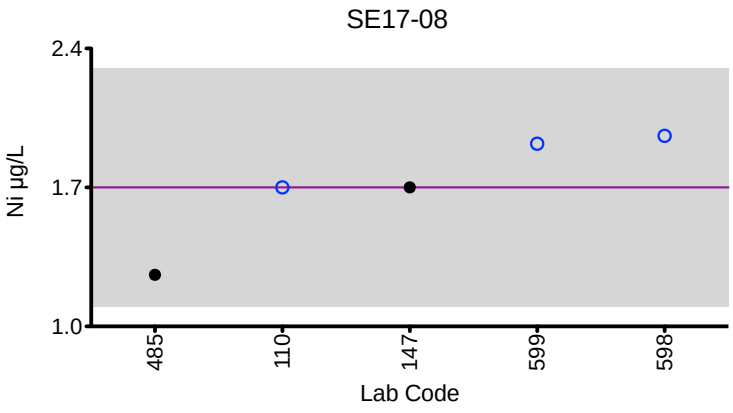
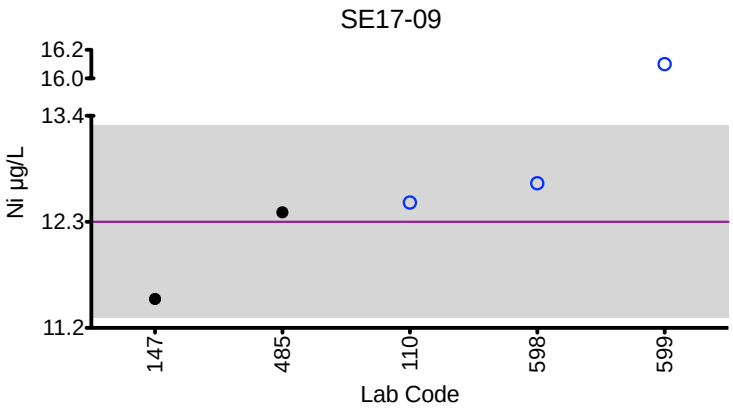
Results for Event #2, 2017: Summary Figures

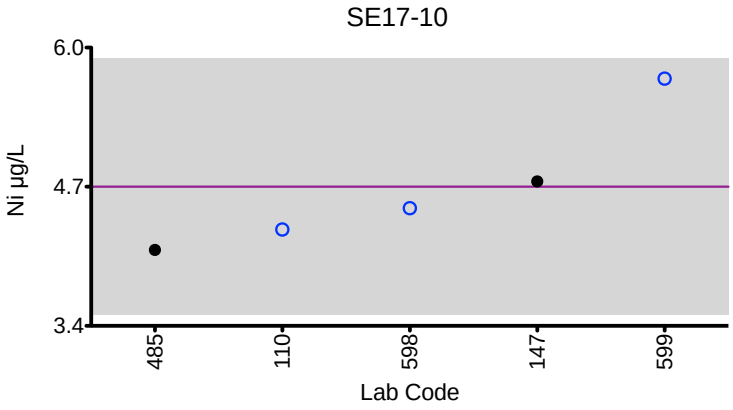
Serum Ni











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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum Pb (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
103	DRC/CC-ICP-MS	7.96	9.71	3.13	1.87	5.56
110	ICP-MS	7.9	9.7	3.1	1.9	5.1
147	ICP-MS	7.89	9.20	3.09	1.76	5.51
597	ICP-MS	5.91	7.11	2.25	1.27	4.09
598	ICP-MS	6.74	8.16	2.59	1.57	4.60
599	DRC/CC-ICP-MS	6.85	9.37	3.02	1.48	4.89
Summary Statistics						
		SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)		7.2	8.9	2.9	1.6	5.0
Arithmetic SD (s)		0.8	1.0	0.4	0.2	0.6
Arithmetic RSD (%)		11.1	11.2	13.8	12.5	12.0
Number of Sample Measurements (N)		6	6	6	6	6

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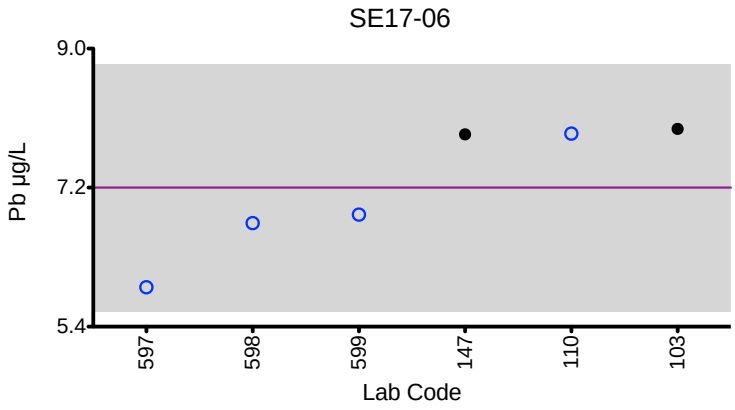
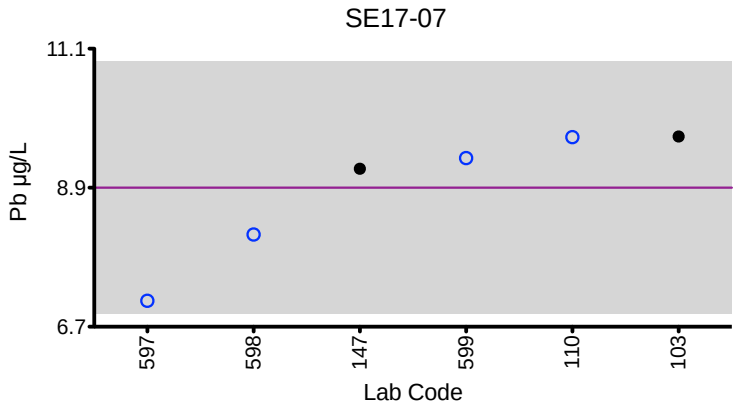
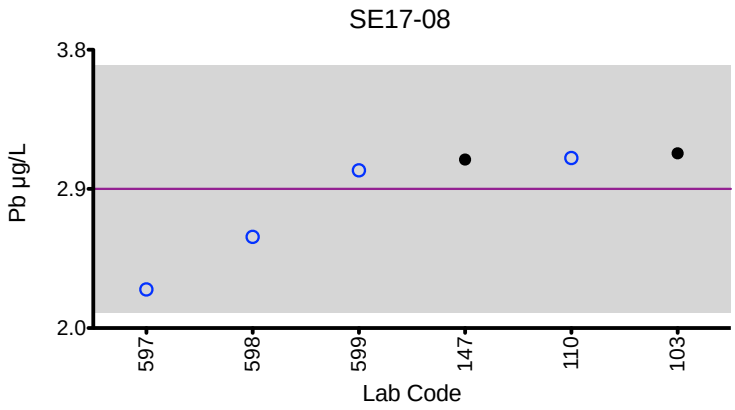
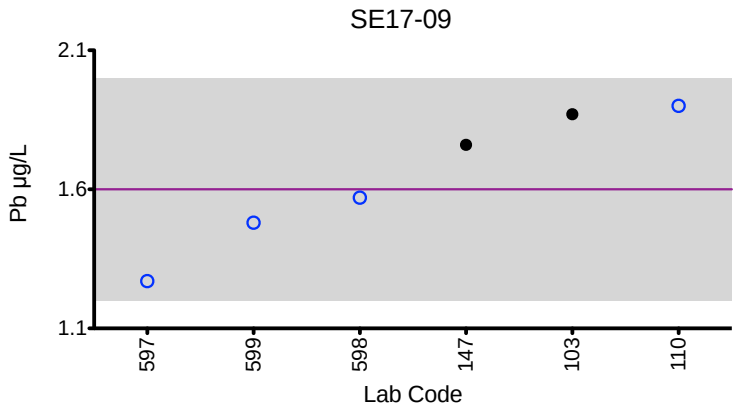
Results for Event #2, 2017: Summary Figures

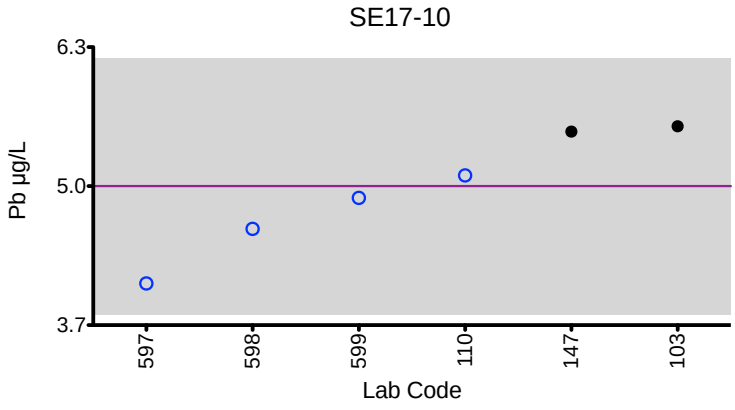
Serum Pb











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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum Sb (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
103	DRC/CC-ICP-MS	1.68	0.430	3.94	5.65	2.43
110	ICP-MS	1.75	0.40	3.66	5.55	2.17
147	ICP-MS	1.41	0.394	3.66	4.58	1.90
597	ICP-MS	1.96	1.14	3.77	5.08	2.72
598	ICP-MS	1.75	0.42	3.91	5.81	2.40
599	DRC/CC-ICP-MS	1.96	0.77	4.29	5.58	2.62
Summary Statistics						
		SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)		1.8	0.59	3.9	5.4	2.4
Arithmetic SD (s)		0.2	0.30	0.2	0.5	0.3
Arithmetic RSD (%)		11.1	51	5.1	9.3	12.5
Number of Sample Measurements (N)		6	6	6	6	6

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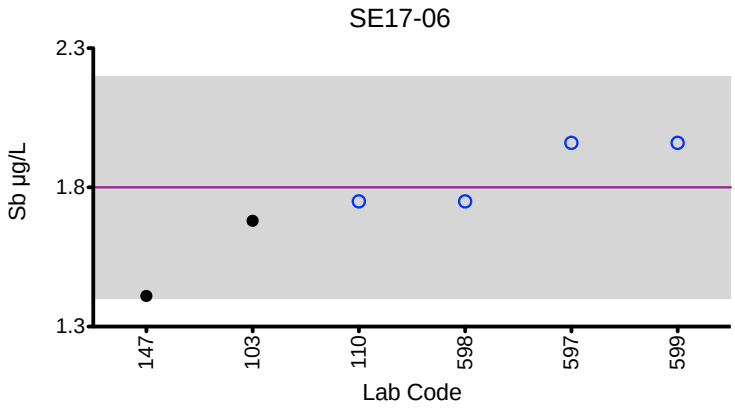
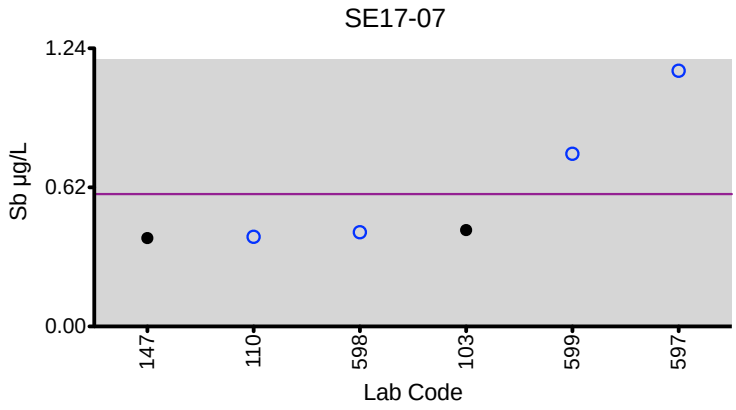
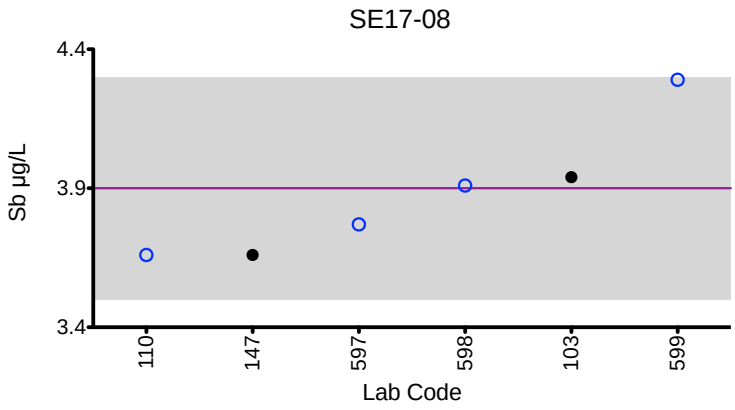
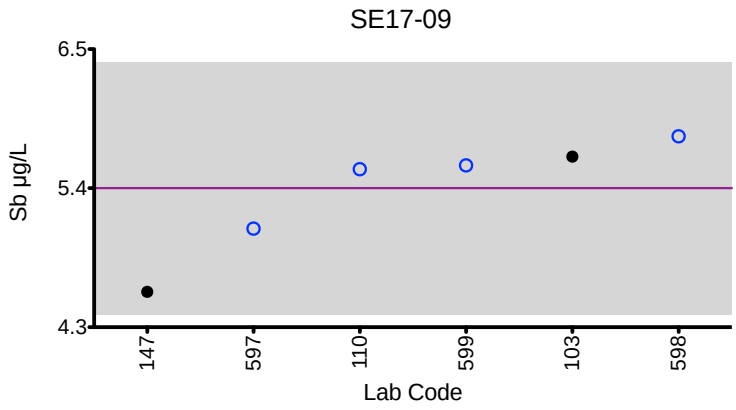
Results for Event #2, 2017: Summary Figures

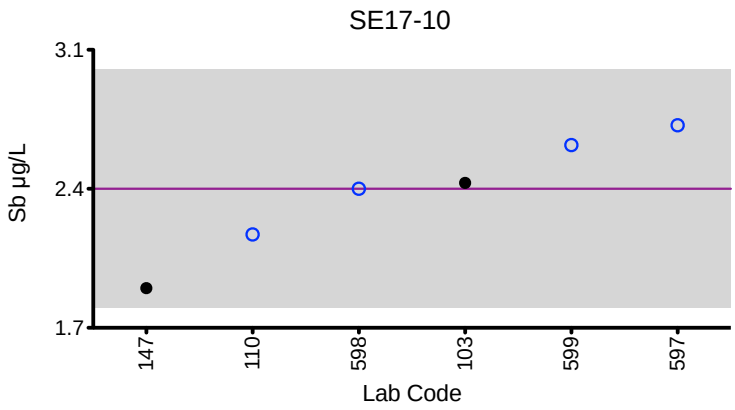
Serum Sb











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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum Sn (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
110	ICP-MS	5.97	1.13	2.95	7.88	2.56
147	ICP-MS	4.42	0.853	2.36	6.33	2.26
597	ICP-MS	4.08	0.65	2.09	5.90	2.01
598	ICP-MS	5.97	1.33	3.09	7.21	2.74
599	DRC/CC-ICP-MS	5.06	1.55	3.27	6.62	2.89
Summary Statistics						
		SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)		5.1	1.1	2.8	6.8	2.5
Arithmetic SD (s)		0.9	0.4	0.5	0.8	0.4
Arithmetic RSD (%)		17.6	36.4	17.9	11.8	16.0
Number of Sample Measurements (N)		5	5	5	5	5

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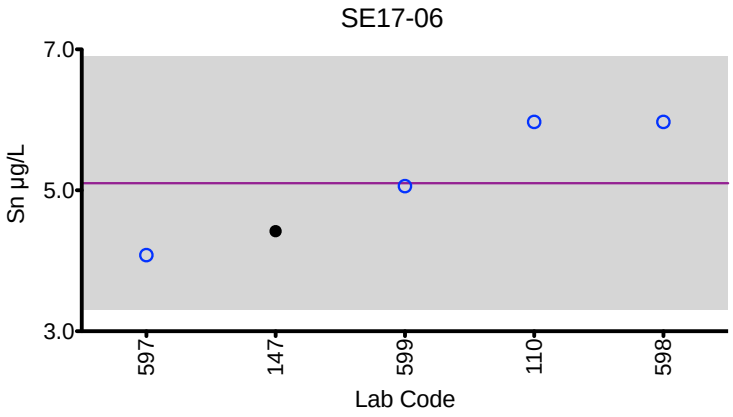
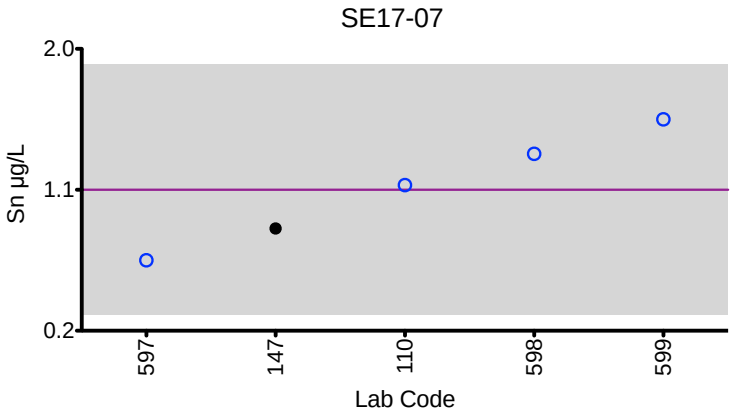
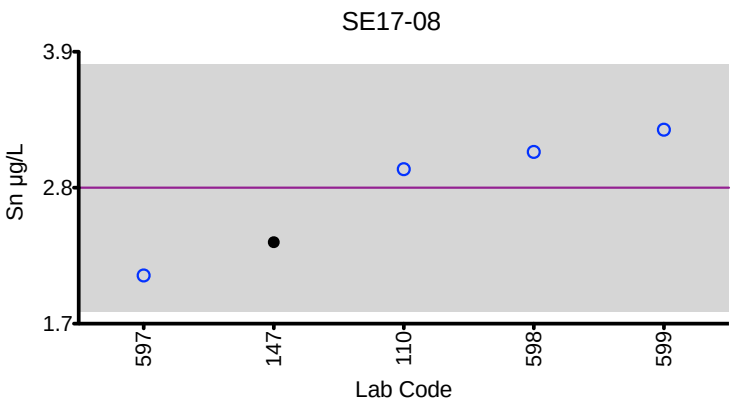
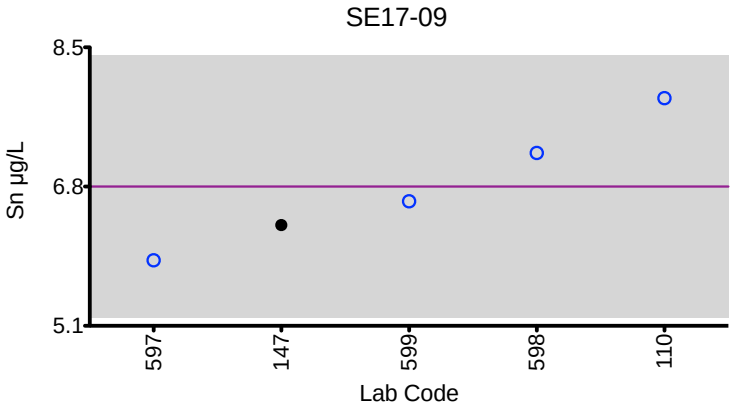
Results for Event #2, 2017: Summary Figures

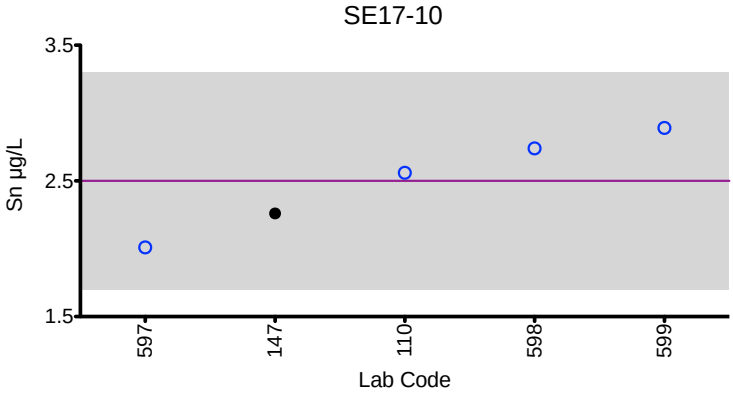
Serum Sn











Legend:
o C/HHEAR Labs ● Other Labs
Horizontal purple line = arithmetic mean of all laboratories.
Gray area = ±2SD of the mean.

The mean and ±2SD of all laboratories are not intended to be quality specifications and are included for informational purposes only.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum Tl (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
103	DRC/CC-ICP-MS	< 0.0300	1.30	0.509	0.104	2.59
110	ICP-MS	0.01	1.32	0.54	0.11	2.61
147	ICP-MS	< 0.0266	1.10	0.411	0.0809	2.15
597	ICP-MS	0.05	1.06	0.43	0.14	2.12
598	ICP-MS	ND(0.05)	0.86	0.19	ND(0.05)	2.00
599	DRC/CC-ICP-MS	<0.1	0.98	<0.1	<0.1	2.19
Summary Statistics						
		SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)		0.03	1.1	0.42	0.11	2.3
Arithmetic SD (s)		0.03	0.2	0.14	0.02	0.3
Arithmetic RSD (%)		100	18.2	33.3	18.2	13.0
Number of Sample Measurements (N)		2	6	5	4	6

*Denotes a statistical Outlier.

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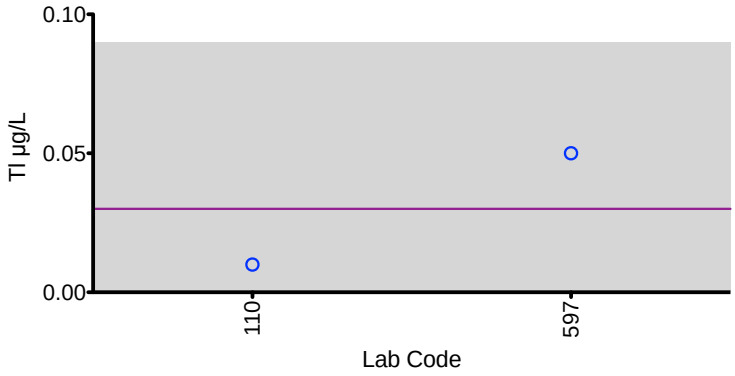
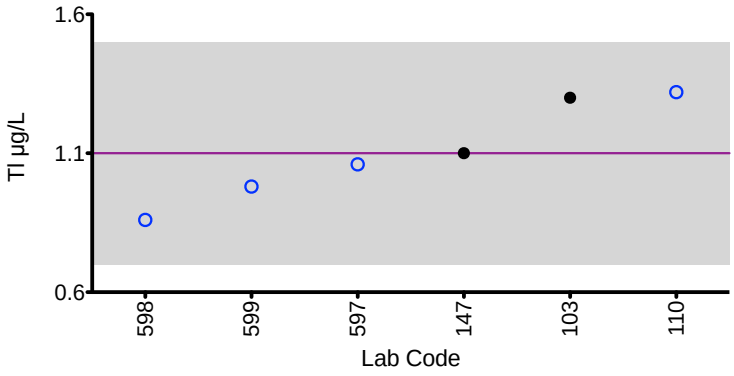
Results for Event #2, 2017: Summary Figures

Serum Tl

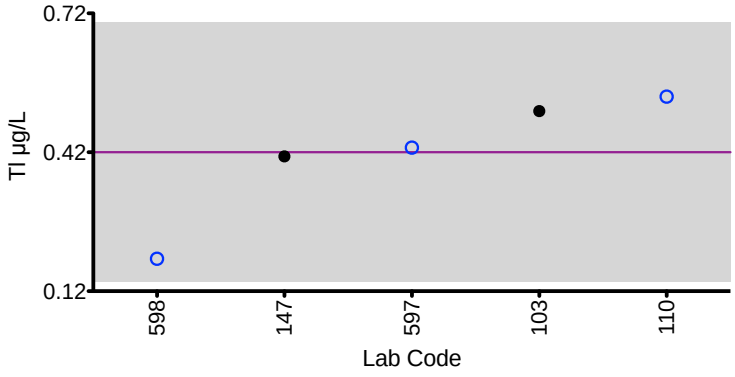
SE17-06



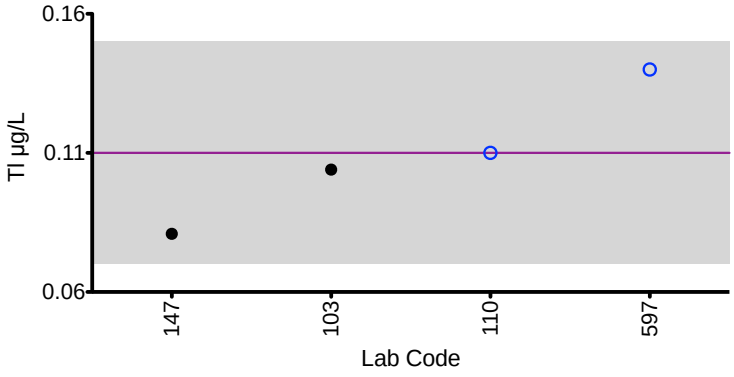
SE17-07



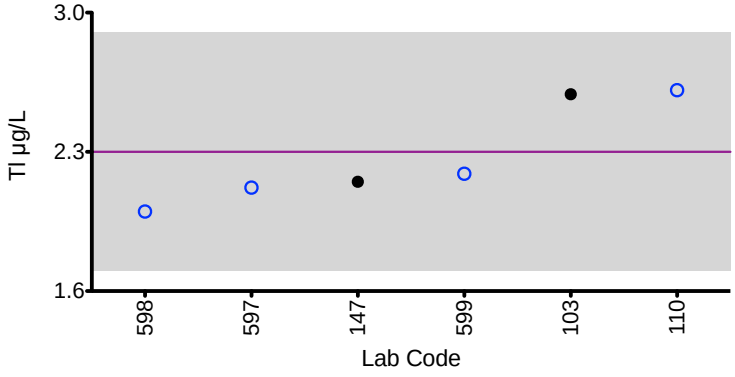
SE17-08



SE17-09



SE17-10



Legend:
o C/HHEAR Labs ● Other Labs
Horizontal purple line = arithmetic mean of all laboratories.
Gray area = ±2SD of the mean.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum Ba (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
110	ICP-MS	2.0	0.8	0.8	1.5	1.7
147	ICP-MS	1.69	0.655	0.640	1.18	1.14
597	ICP-MS	1.65	0.66	0.77	1.24	1.43
598	ICP-MS	2.21	0.69	0.55	1.33	1.19

Summary Statistics					
	SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)	1.9	0.70	0.69	1.3	1.4
Arithmetic SD (s)	0.3	0.07	0.12	0.1	0.3
Arithmetic RSD (%)	15.8	10.0	17.4	7.7	21.4
Number of Sample Measurements (N)	4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum Be (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
110	ICP-MS	3.59	1.87	0.38	1.05	4.09
147	ICP-MS	3.73	1.76	< 0.441	0.982	3.62
598	ICP-MS	3.62	2.02	0.59	1.13	4.20
599	DRC/CC-ICP-MS	4.46	2.48	0.48	1.01	5.35
Summary Statistics						
		SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)		3.9	2.0	0.48	1.0	4.3
Arithmetic SD (s)		0.4	0.3	0.11	0.1	0.7
Arithmetic RSD (%)		10.3	15.0	22.9	10.0	16.3
Number of Sample Measurements (N)		4	4	3	4	4

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum Cs (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
110	ICP-MS	0.44	0.96	0.93	0.99	0.92
597	ICP-MS	0.50	0.96	0.92	0.99	1.00
598	ICP-MS	0.26	0.72	0.77	0.80	0.74
Summary Statistics						
		SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)		0.40	0.88	0.87	0.93	0.89
Arithmetic SD (s)		0.12	0.14	0.09	0.11	0.13
Arithmetic RSD (%)		30.0	15.9	10.3	11.8	14.6
Number of Sample Measurements (N)		3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum Fe (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
457	ICP-AES/OES	525.0	874	872	507	516
483	DRC/CC-ICP-MS	557	1010	983	556	565
598	DRC/CC-ICP-MS	574	974	981	573	563

Summary Statistics					
	SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)	552	953	945	545	548
Arithmetic SD (s)	25	70	64	34	28
Arithmetic RSD (%)	4.5	7.3	6.8	6.2	5.1
Number of Sample Measurements (N)	3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum Pt (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
110	ICP-MS	0.09	0.34	0.95	0.27	1.48
598	ICP-MS	0.08	0.30	0.83	0.24	1.41
599	DRC/CC-ICP-MS	0.12	0.45	1.28	0.35	1.97
Summary Statistics						
		SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)		0.10	0.36	1.0	0.29	1.6
Arithmetic SD (s)		0.02	0.08	0.2	0.06	0.3
Arithmetic RSD (%)		20.0	22.2	20.0	20.7	18.8
Number of Sample Measurements (N)		3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum Sr (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
103	DRC/CC-ICP-MS	35.3	116	108	76.6	25.3
200	ICP-MS	39.4	130.5	127	96.4	31.5
Summary Statistics						
		SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)		37.4	123	118	86.5	28.4
Arithmetic SD (s)		2.9	10	13	14.0	4.4
Arithmetic RSD (%)		7.8	8.1	11.0	16.2	15.5
Number of Sample Measurements (N)		2	2	2	2	2

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum Ti (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
200	DRC/CC-ICP-MS	3.6	6.3	6.1	1.0	5.7
485	HR-ICP-MS	4.11	8.16	7.03	<0.3	8.81
Summary Statistics						
		SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)		3.9	7.2	6.6	NA	7.3
Arithmetic SD (s)		0.4	1.3	0.7	NA	2.2
Arithmetic RSD (%)		10.3	18.1	10.6	NA	30.1
Number of Sample Measurements (N)		2	2	2	NA	2

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum U (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
103	DRC/CC-ICP-MS	0.0815	0.0187	0.141	0.0540	0.0104
110	ICP-MS	0.079	0.014	0.132	0.059	0.009
147	ICP-MS	0.0690	< 0.0145	0.118	0.0460	< 0.0145
598	ICP-MS	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)
599	DRC/CC-ICP-MS	<0.1	<0.1	0.19	<0.1	<0.1
Summary Statistics						
		SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)		0.076	0.016	0.145	0.053	0.010
Arithmetic SD (s)		0.007	0.003	0.031	0.007	0.001
Arithmetic RSD (%)		9.2	18.8	21.4	13.2	10.0
Number of Sample Measurements (N)		3	2	4	3	2

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum V (µg/L)

Lab Code	Method	SE17-06	SE17-07	SE17-08	SE17-09	SE17-10
110	DRC/CC-ICP-MS	1.7	4.6	7.5	3.0	1.0
147	DRC/CC-ICP-MS	1.50	4.26	6.53	2.74	0.694
485	HR-ICP-MS	1.60	4.46	7.06	2.91	0.753
598	DRC/CC-ICP-MS	1.91	4.56	7.44	3.23	0.97

Summary Statistics

	SE17-06	SE17-07	SE17-08	SE17-09	SE17-10
Arithmetic Mean ($\bar{x}$)	1.7	4.5	7.1	3.0	0.9
Arithmetic SD (s)	0.2	0.2	0.4	0.2	0.2
Arithmetic RSD (%)	11.8	4.4	5.6	6.7	22.2
Number of Sample Measurements (N)	4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #2, 2017:
Laboratory Data and Summary Statistics

Serum W (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
110	ICP-MS	1.85	2.37	1.34	0.63	4.34
147	ICP-MS	2.06	2.56	1.42	0.679	4.34
200	ICP-MS	2.1	2.7	1.5	0.7	4.8
598	ICP-MS	1.83	2.18	1.16	0.31	4.00
Summary Statistics						
		SE17-06	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
Arithmetic Mean ($\bar{x}$)		2.0	2.5	1.4	0.6	4.4
Arithmetic SD (s)		0.1	0.2	0.1	0.2	0.3
Arithmetic RSD (%)		5.0	8.0	7.1	33.3	6.8
Number of Sample Measurements (N)		4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #2, 2017: Additional Elements in Serum

Serum Ag (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
147	ICP-MS	< 0.248	< 0.248	< 0.248	< 0.248	< 0.248

Serum B (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
200	ICP-MS	35.6	33.5	33.5	41	40

Serum Bi (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
147	ICP-MS	< 0.201	< 0.201	< 0.201	< 0.201	< 0.201

Serum Ca (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
598	ICP-AES/OES	83100	85900	114000	88000	85500

Serum I (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
147	ICP-MS	54.7	51.9	52.3	49.0	52.8

Serum Li (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
147	ICP-MS	0.477	1.28	1.44	0.708	0.749

Serum Mg (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
597	ICP-MS	13425.98	14047.40	14370.76	15366.74	15482.77

Serum Te (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
147	ICP-MS	< 0.0880	< 0.0880	< 0.0880	< 0.0880	< 0.0880

Serum Th (µg/L)						
Lab Code	**Method**	**SE17-06**	**SE17-07**	**SE17-08**	**SE17-09**	**SE17-10**
147	ICP-MS	< 0.00789	< 0.00789	< 0.00789	< 0.00789	< 0.00789

References

1. ISO/FDIS-13528 (2005) Statistical methods for use in proficiency testing by interlaboratory comparisons. International Organization for Standardization, Geneva.

2. Taylor A, Angerer J, Arnaud J, Claeys F, Jones RL, Mazarrasa O, Mairiaux E, Menditto A, Parsons PJ, Patriarca M, Pineau A, Valkonen S, Weber J-P, Weykamp C. Occupational and environmental laboratory medicine: A network of EQAS organisers. Accreditation and Quality Assurance. 2006;11(8-9):435-9. PubMed PMID: 086NJ-0011.