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New York State Biomonitoring Program for Trace Elements

Event #3, 2017

Trace Elements in Whole Blood, Urine, and Serum

December, 2017

Wadsworth Center
NEW YORK STATE DEPARTMENT OF HEALTH
Trace Elements Laboratory

Event #3, 2017:
Trace Elements in Whole Blood, Urine, and Serum

12/14/2017

Dear Laboratory Director,

This report summarizes performance for the third 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 #1 of 2018) will be shipped February 28, 2018. Comments about this report may be directed to trel@health.ny.gov. If you have not yet enrolled for 2018 please contact Dr. Galusha at Aubrey.Galusha@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 #3, 2017

Trace Elements in Whole Blood

Wadsworth Center
NEW YORK STATE DEPARTMENT OF HEALTH
Trace Elements Laboratory

Event #3, 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, 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 #3, 2017: Summary Statistics

Whole Blood As (µg/L)					
	BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Target (Arithmetic Mean ($\bar{x}$))	6.8	11.2	25.1	44.4	13.1
Upper Limit	12.8	17.2	31.1	53.28	19.1
Lower Limit	0.8	5.2	19.1	35.52	7.1
Arithmetic SD (s)	1.4	1.6	4.7	7.6	2.3
Arithmetic RSD (%)	20.6	14.3	18.7	17.1	17.6
Number of Sample Measurements (N)	7	8	8	8	8

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 #3, 2017:
Performance of Participating Laboratories

Whole Blood As (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
	Target	**6.8**	**11.2**	**25.1**	**44.4**	**13.1**
103	DRC/CC-ICP-MS	6.20	10.9	24.2	44.0	12.9
110	DRC/CC-ICP-MS	6.1	10.3	23.2	44.0	12.6
147	ICP-MS	6.46	10.5	22.3	39.6	11.7
200	ICP-MS	9.0	12.8	29.3	46.5	15.8
293	ICP-MS	NR	11.6	25.55	47.05	13.54
391	DRC/CC-ICP-MS	4.7	8.2	16.375 ↓	28.985 ↓	8.375
597	DRC/CC-ICP-MS	7.26	12.2	28.7	52.8	14.2
598	DRC/CC-ICP-MS	7.57	13.4	31.3 ↑	52.4	15.3

Based on the grading criteria for As in Whole Blood, 93% of results were satisfactory, with 1 of the 8 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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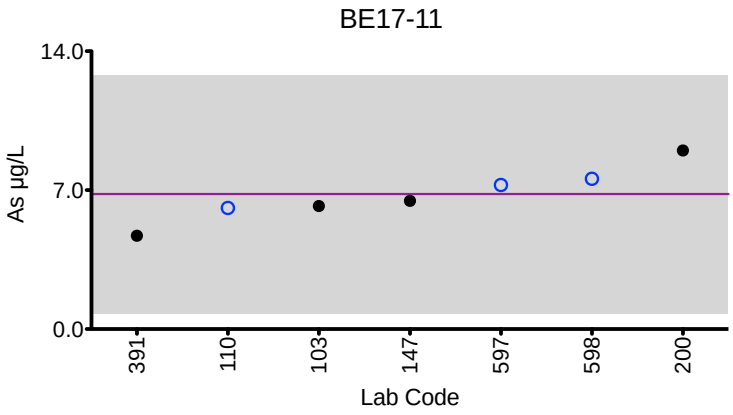
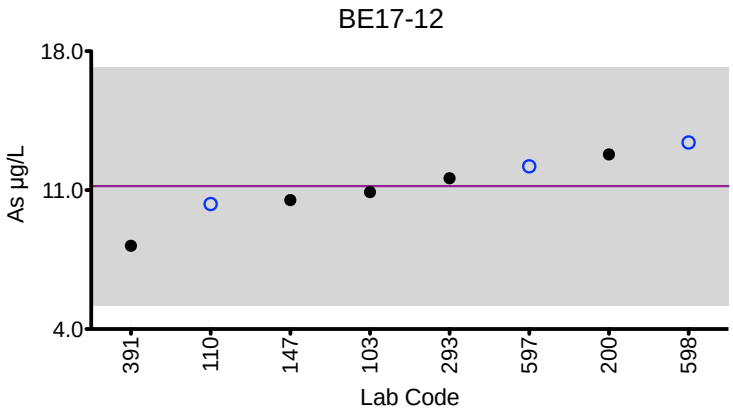
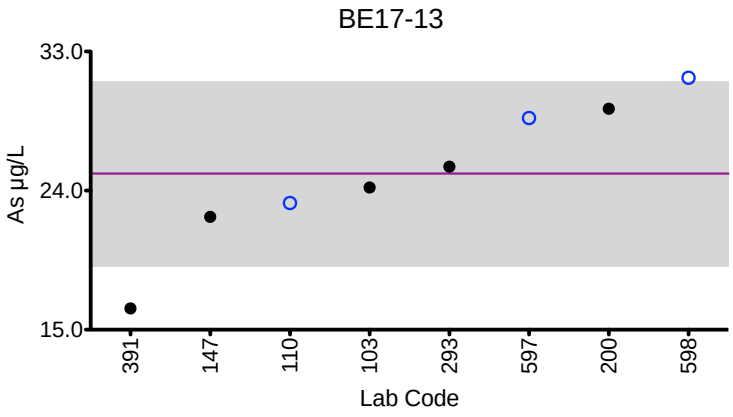
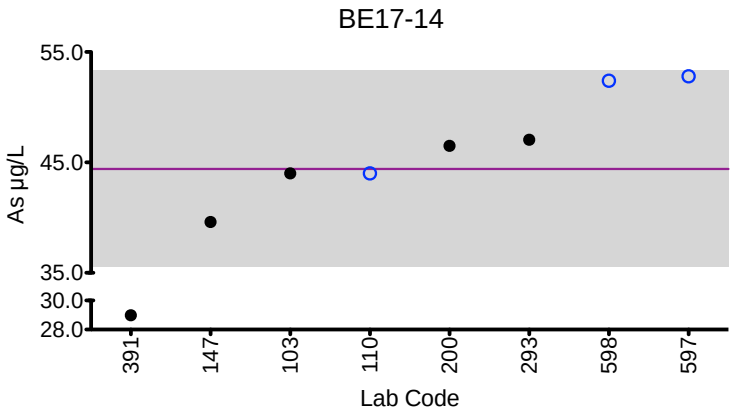
Results for Event #3, 2017: Summary Figures

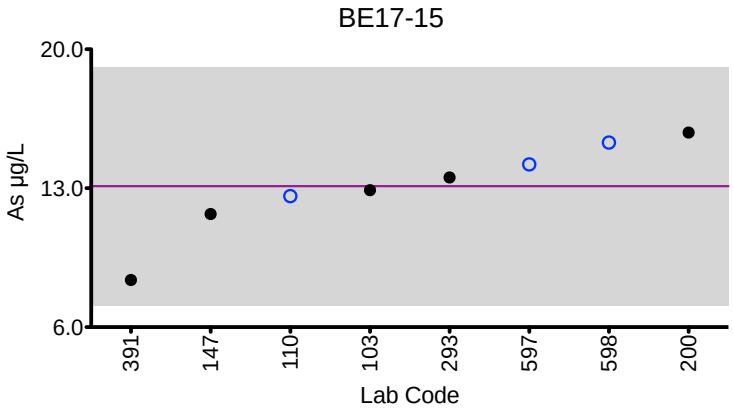
Whole Blood As











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 #3, 2017: Summary Statistics

Whole Blood Cd (µg/L)					
	BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Target (Robust Mean (x*))	1.1	2.7	6.2	6.4	9.7
Upper Limit	2.1	3.7	7.2	7.4	11.2
Lower Limit	0.1	1.7	5.2	5.4	8.2
Robust SD (s*)	0.1	0.2	0.4	0.4	0.7
Robust RSD (%)	9.1	7.4	6.5	6.3	7.2
Number of Sample Measurements (N)	15	16	16	16	16
Standard Uncertainty (*u*)	0.046	0.057	0.123	0.136	0.226

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 #3, 2017:
Performance of Participating Laboratories

Whole Blood Cd (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
	Target	**1.1**	**2.7**	**6.2**	**6.4**	**9.7**
103	DRC/CC-ICP-MS	1.11	2.67	6.34	6.49	10.1
107	ICP-MS	1.2	2.7	6.1	6.7	9.7
110	ICP-MS	1.04	2.55	5.98	6.24	9.63
116	DRC/CC-ICP-MS	<1.06	2.73	6.08	6.67	9.32
147	ICP-MS	1.04	2.45	5.55	5.95	8.95
200	ICP-MS	2.1 ↑	4.0 ↑	8.8 ↑	8.2 ↑	12.0 ↑
293	ICP-MS	1.14	2.55	5.97	6.25	9.55
391	DRC/CC-ICP-MS	0.681	1.577 ↓	3.746 ↓	3.833 ↓	5.826 ↓
399	DRC/CC-ICP-MS	1.08	2.59	5.98	6.25	9.49
401	DRC/CC-ICP-MS	1.1	2.7	6.5	6.7	10.6
597	DRC/CC-ICP-MS	1.39	3.27	7.60 ↑	7.96 ↑	11.69 ↑
598	DRC/CC-ICP-MS	1.01	2.64	6.36	6.17	9.23
599	DRC/CC-ICP-MS	1.39	2.72	7.69 ↑	5.62	5.96 ↓
605	ICP-MS	1.23	2.78	6.03	6.25	9.80
606	DRC/CC-ICP-MS	1.34	2.87	6.48	6.57	10.3
686	ICP-MS	1.05	2.49	6.07	6.28	9.69

Based on the grading criteria for Cd in Whole Blood, 83% of results were satisfactory, with 4 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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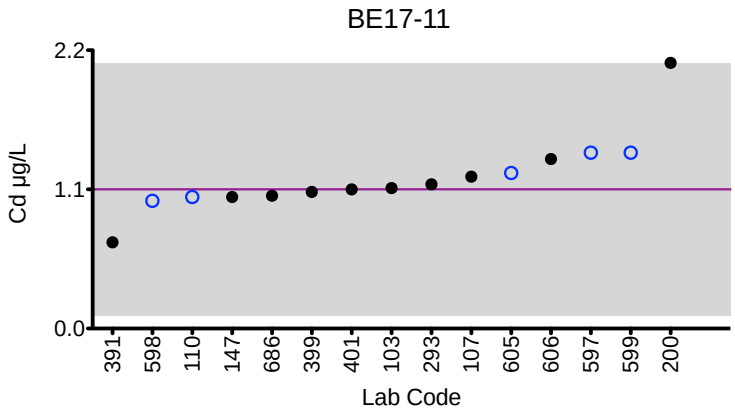
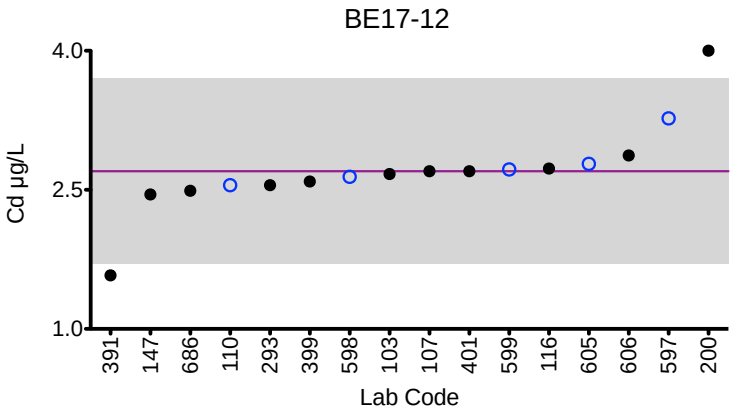
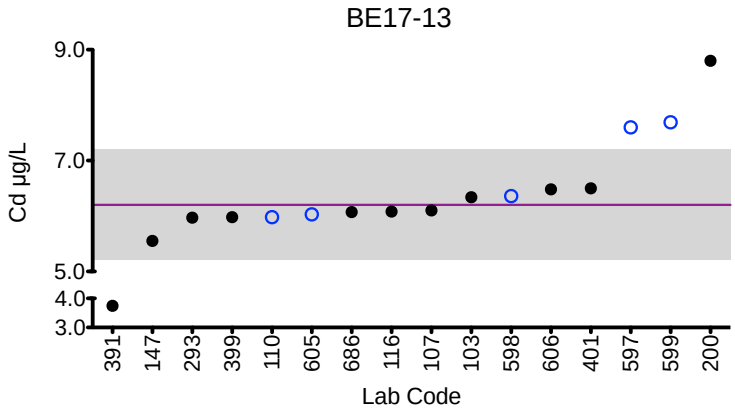
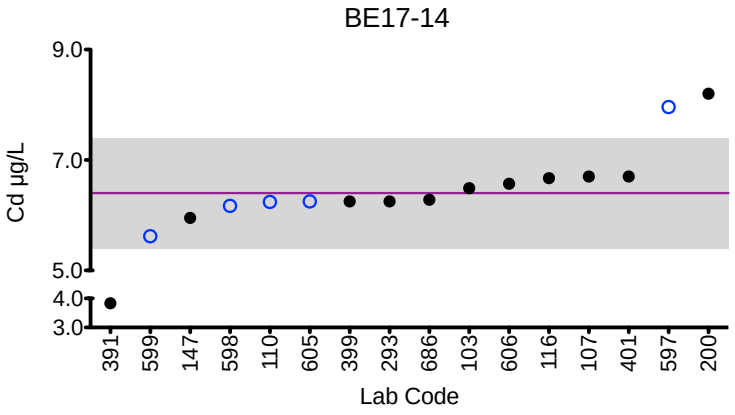
Results for Event #3, 2017: Summary Figures

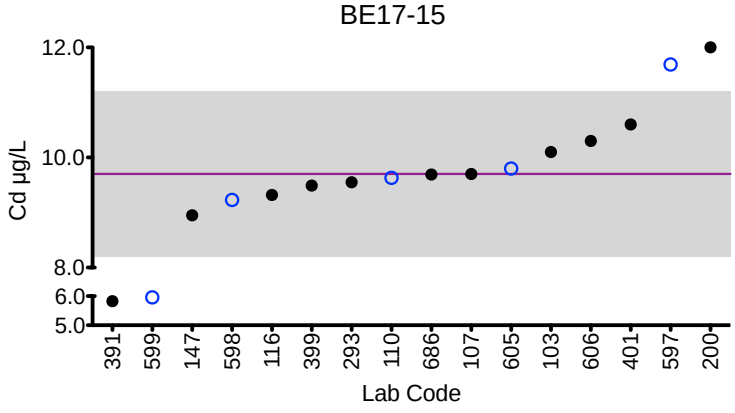
Whole Blood Cd











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 6.7 µg/L.

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Results for Event #3, 2017: Summary Statistics

Whole Blood Co (µg/L)					
	BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Target (Arithmetic Mean ($\bar{x}$))	5.8	0.8	10.9	1.4	7.6
Upper Limit	7.3	2.3	13.08	2.9	9.12
Lower Limit	4.3	0	8.72	0	6.08
Arithmetic SD (s)	0.5	0.1	2.0	0.2	1.2
Arithmetic RSD (%)	8.6	12.5	18.3	14.3	15.8
Number of Sample Measurements (N)	8	9	9	8	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 #3, 2017:
Performance of Participating Laboratories

Whole Blood Co (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
	Target	**5.8**	**0.8**	**10.9**	**1.4**	**7.6**
103	DRC/CC-ICP-MS	5.43	0.753	10.7	1.34	7.58
110	ICP-MS	5.5	0.8	11.1	1.3	7.9
147	ICP-MS	5.56	0.790	10.7	1.30	7.42
293	ICP-MS	5.42	0.71	10.75	1.35	7.56
391	DRC/CC-ICP-MS	*0.352 ↓	0.482	6.605 ↓	0.955	4.962 ↓
401	DRC/CC-ICP-MS	5.5	0.7	10.3	1.4	7.9
597	DRC/CC-ICP-MS	6.83	0.959	13.8 ↑	1.76	9.20 ↑
598	ICP-MS	5.64	0.97	11.9	1.57	8.02
599	DRC/CC-ICP-MS	6.12	0.872	12.6	*13.7 ↑	*1.91 ↓

Based on the grading criteria for Co in Whole Blood, 84% of results were satisfactory, with 3 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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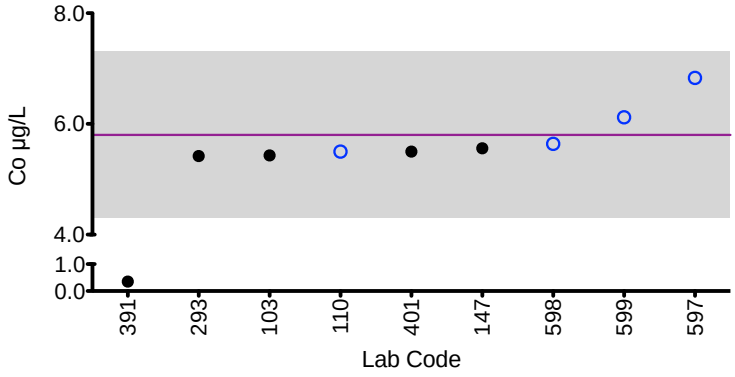
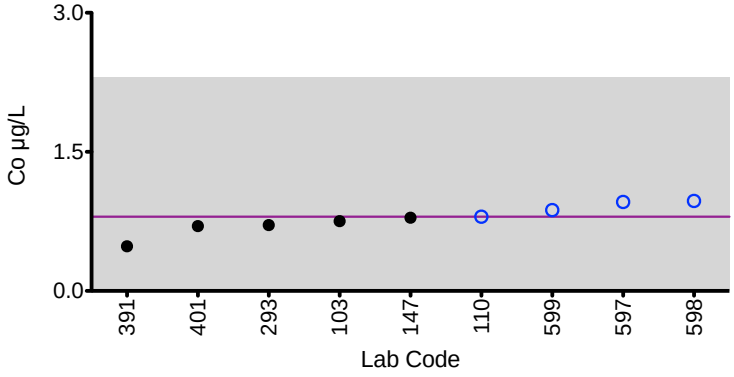
Results for Event #3, 2017: Summary Figures

Whole Blood Co

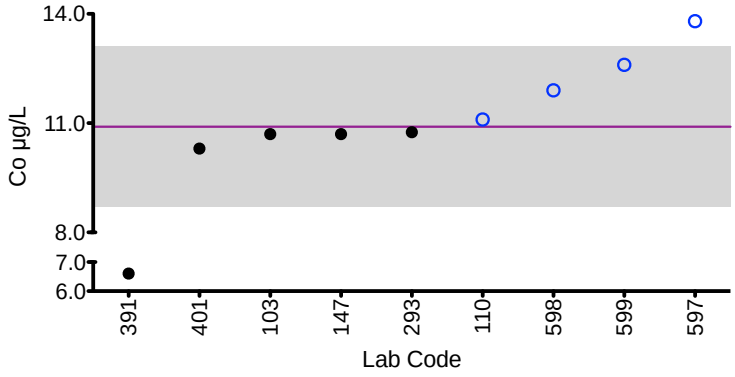
BE17-11



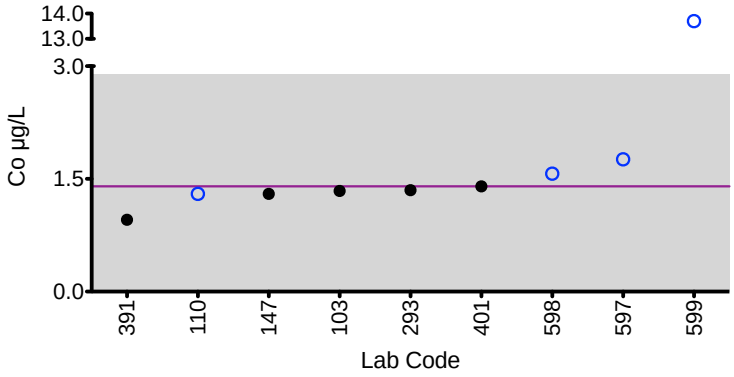
BE17-12



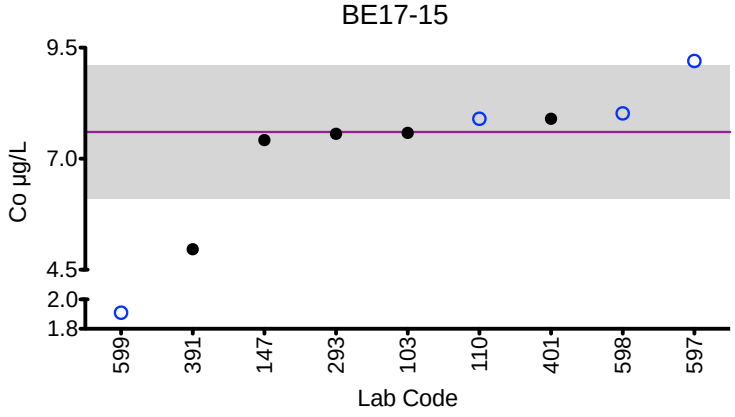
BE17-13



BE17-14



BE17-15



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 #3, 2017: Summary Statistics

Whole Blood Cr (µg/L)					
	BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Target (Arithmetic Mean ($\bar{x}$))	2.7	2	11.4	5.2	7.1
Upper Limit	4.7	4	13.68	7.2	9.1
Lower Limit	0.7	0	9.12	3.2	5.1
Arithmetic SD (s)	1.0	0.9	0.6	0.5	0.8
Arithmetic RSD (%)	37.0	45.0	5.3	9.6	11.3
Number of Sample Measurements (N)	8	7	7	7	8

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.

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Results for Event #3, 2017:
Performance of Participating Laboratories

Whole Blood Cr (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
	Target	**2.7**	**2**	**11.4**	**5.2**	**7.1**
103	DRC/CC-ICP-MS	2.34	1.31	11.1	4.99	6.91
110	DRC/CC-ICP-MS	2.2	1.2	10.9	4.6	6.3
147	DRC/CC-ICP-MS	2.51	1.43	11.4	5.07	6.92
293	ICP-MS	2.75	1.77	11.6	5.55	7.3
391	DRC/CC-ICP-MS	4.66	3.36	*8.8 ↓	*9.089 ↑	8.5
401	DRC/CC-ICP-MS	3.4	3.1	10.8	6.0	7.9
597	DRC/CC-ICP-MS	1.26	*6.04 ↑	12.2	4.68	6.32
598	DRC/CC-ICP-MS	2.33	1.73	12.1	5.22	6.85

Based on the grading criteria for Cr in Whole Blood, 93% of results were satisfactory, with 1 of the 8 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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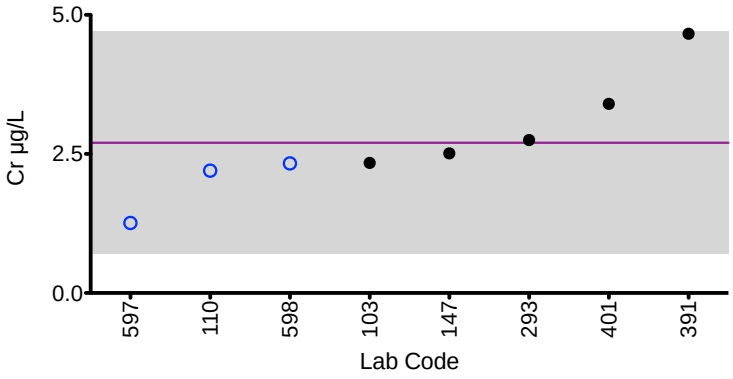
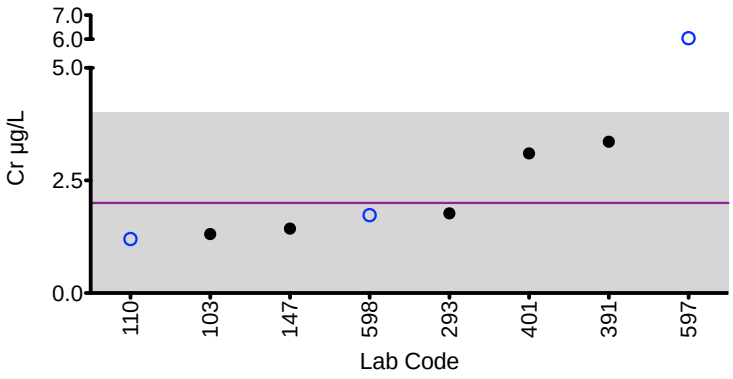
Results for Event #3, 2017: Summary Figures

Whole Blood Cr

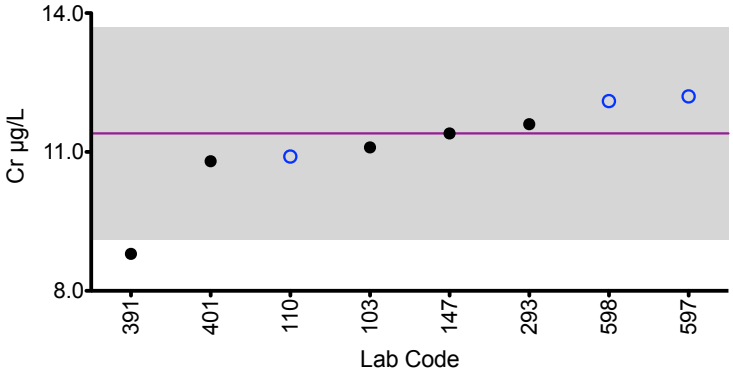
BE17-11



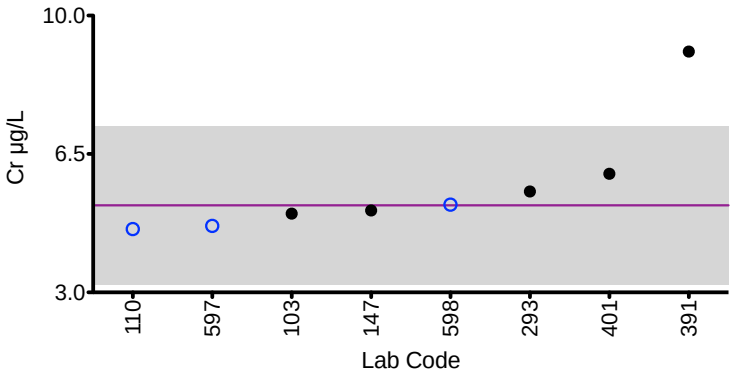
BE17-12



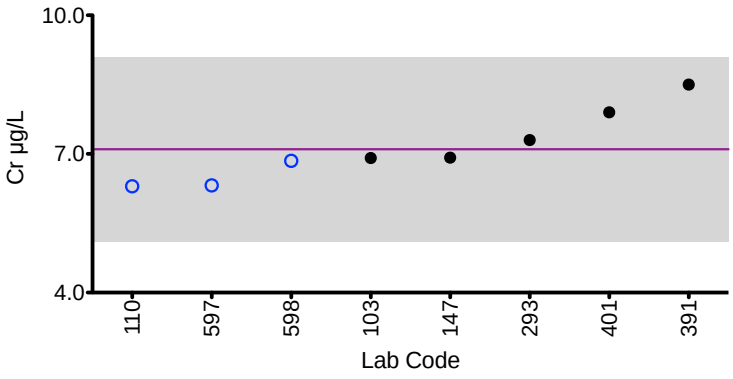
BE17-13



BE17-14



BE17-15



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 #3, 2017: Summary Statistics

Whole Blood Hg (µg/L)					
	BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Target (Robust Mean (x*))	5.9	2.6	22.2	13.6	10.7
Upper Limit	8.9	5.6	28.9	17.7	13.9
Lower Limit	2.9	0	15.5	9.5	7.5
Robust SD (s*)	0.6	0.2	1.1	0.8	0.6
Robust RSD (%)	10.2	7.7	5.0	5.9	5.6
Number of Sample Measurements (N)	15	15	15	15	15
Standard Uncertainty (*u*)	0.190	0.071	0.339	0.273	0.200

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 #3, 2017:
Performance of Participating Laboratories

Whole Blood Hg (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
	Target	**5.9**	**2.6**	**22.2**	**13.6**	**10.7**
103	DRC/CC-ICP-MS	5.90	2.55	22.4	13.5	10.6
107	DRC/CC-ICP-MS	6.1	2.6	23	14	11
110	ICP-MS	5.41	2.42	21.9	12.3	10.2
116	DRC/CC-ICP-MS	6.27	2.80	23.9	13.9	10.9
147	ICP-MS	5.28	2.35	19.9	11.9	9.51
200	ICP-MS	6.8	3.0	27.0	15.8	13.0
293	ICP-MS	5.51	2.77	22.1	12.87	11.16
391	CV-AAS	7.02	2.67	16.4	23.1 ↑	10.91
399	DRC/CC-ICP-MS	5.74	2.57	22.4	13.5	10.5
401	DRC/CC-ICP-MS	5.8	2.4	20.9	12.8	9.8
598	ICP-MS	5.51	2.90	22.7	13.2	10.3
599	DRC/CC-ICP-MS	4.65	1.28	20.8	21.7 ↑	12.6
605	ICP-MS	6.28	2.67	21.7	13.4	10.7
606	DRC/CC-ICP-MS	6.29	2.57	22.7	13.6	10.7
686	ICP-MS	6.22	2.67	23.0	14.0	11.1

Based on the grading criteria for Hg in Whole Blood, 97% 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

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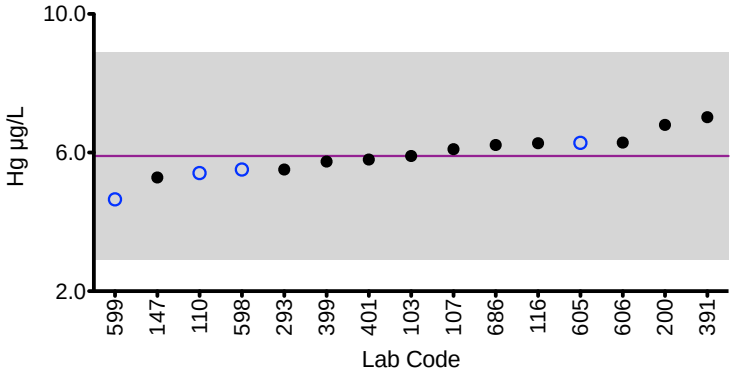
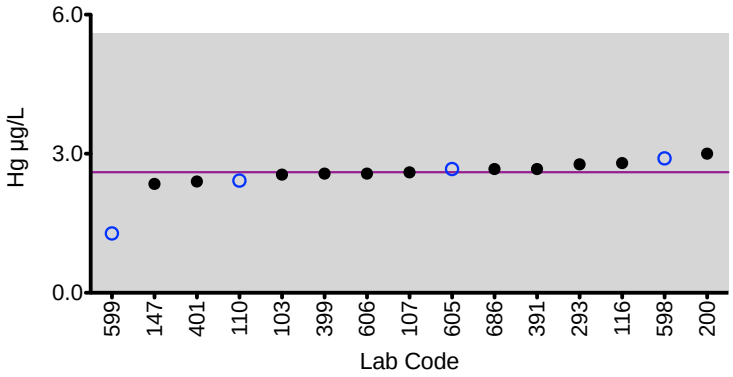
Results for Event #3, 2017: Summary Figures

Whole Blood Hg

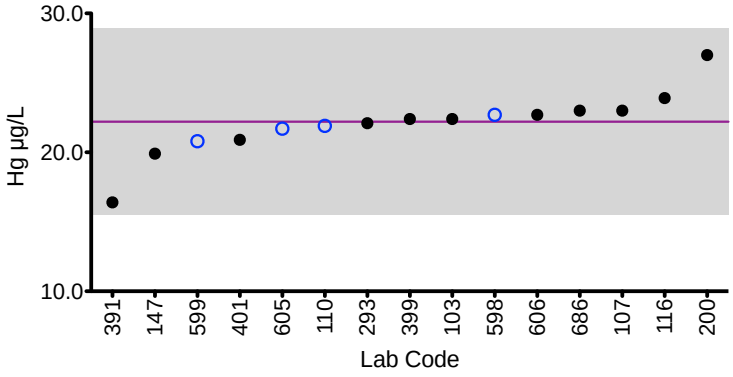
BE17-11



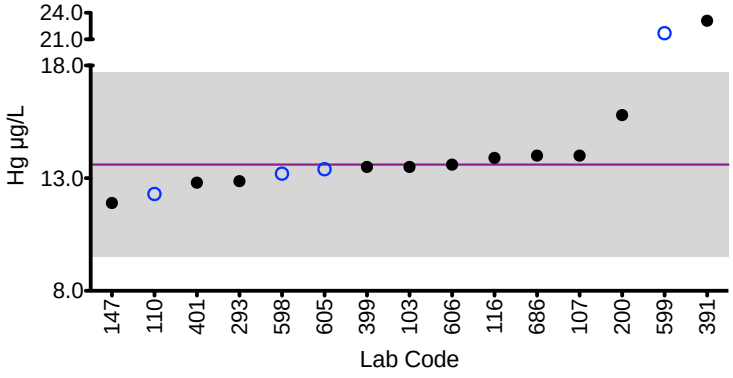
BE17-12



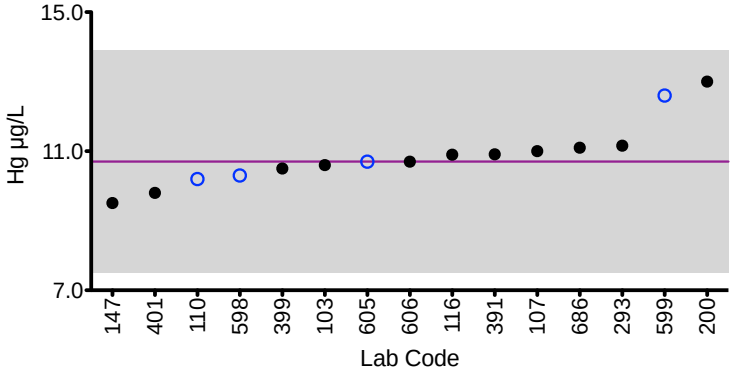
BE17-13



BE17-14



BE17-15



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 #3, 2017: Summary Statistics

Whole Blood Mn (µg/L)					
	BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Target (Robust Mean (x*))	7.1	25.9	18.9	39.5	9.2
Upper Limit	10.1	30.3	22.1	46	12.2
Lower Limit	4.1	21.5	15.7	33	6.2
Robust SD (s*)	1.0	1.8	1.4	3.1	0.7
Robust RSD (%)	14.1	6.9	7.4	7.8	7.6
Number of Sample Measurements (N)	12	12	12	12	11
Standard Uncertainty (*u*)	0.374	0.655	0.495	1.110	0.281

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 17.7 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 #3, 2017:
Performance of Participating Laboratories

Whole Blood Mn (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
	Target	**7.1**	**25.9**	**18.9**	**39.5**	**9.2**
103	DRC/CC-ICP-MS	7.14	26.5	19.2	41.3	9.30
107	DRC/CC-ICP-MS	7.7	27	19	42	9.7
110	ICP-MS	5.3	23.3	18.0	37.8	9.7
147	ICP-MS	7.61	24.5	18.3	37.4	9.04
293	ICP-MS	6.12	24.25	17.7	38.43	7.76
391	DRC/CC-ICP-MS	15.254 ↑	25.309	16.1	36.379	11.943
399	DRC/CC-ICP-MS	7.05	25.7	18.6	40.5	8.86
401	DRC/CC-ICP-MS	6.5	24.6	18.0	38.7	8.4
597	DRC/CC-ICP-MS	6.51	27.6	20.8	45.3	7.69
598	ICP-MS	6.20	25.4	19.6	40.1	9.29
599	DRC/CC-ICP-MS	10.3 ↑	29.1	23.0 ↑	25.9 ↓	*57.1 ↑
606	DRC/CC-ICP-MS	7.73	28.1	20.7	43.1	9.86

Based on the grading criteria for Mn in Whole Blood, 92% 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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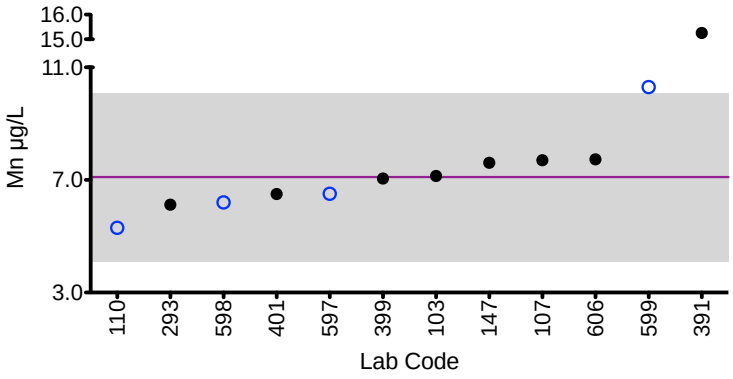
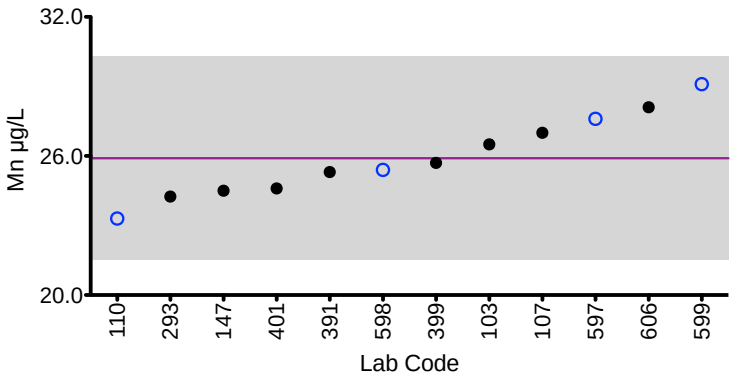
Results for Event #3, 2017: Summary Figures

Whole Blood Mn

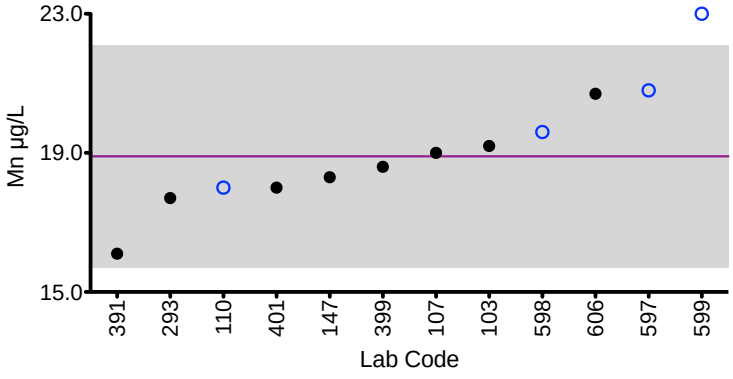
BE17-11



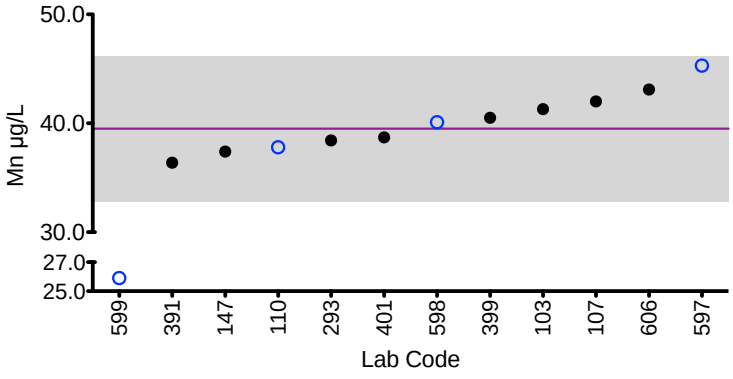
BE17-12



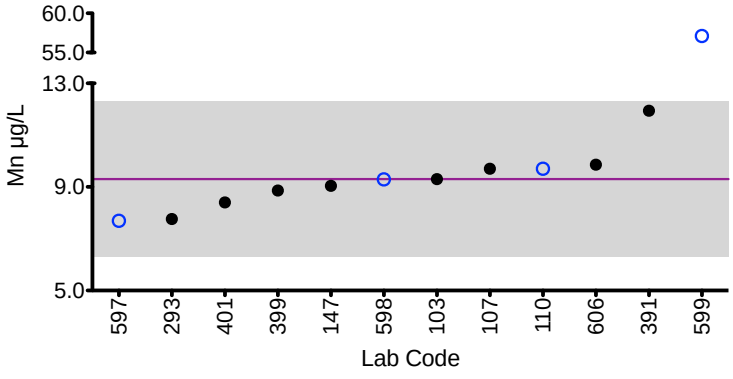
BE17-13



BE17-14



BE17-15



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 ±17% around the target value, whichever is greater; thus, it is fixed at ±3 µg/L at concentrations less than or equal to 17.7 µg/L.

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Results for Event #3, 2017: Summary Statistics

Whole Blood Pb (µg/dL)					
	BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Target (Robust Mean (x*))	0.97	51.9	5.3	9.54	15.8
Upper Limit	2.97	57.1	7.3	11.5	17.8
Lower Limit	0	46.7	3.3	7.5	13.8
Robust SD (s*)	0.10	2.9	0.28	0.55	0.7
Robust RSD (%)	10.3	5.6	5.3	5.8	4.4
Number of Sample Measurements (N)	14	17	17	17	17
Standard Uncertainty (*u*)	0.033	0.877	0.085	0.165	0.212

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 #3, 2017:
Performance of Participating Laboratories

Whole Blood Pb (µg/dL)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
	Target	**0.97**	**51.9**	**5.3**	**9.54**	**15.8**
103	DRC/CC-ICP-MS	1.00	53.9	5.53	10.2	16.8
107	ICP-MS	0.92	52	5.4	9.9	16
110	ICP-MS	0.94	51.1	5.34	9.75	16.1
116	DRC/CC-ICP-MS	<0.948	51.6	5.34	9.80	16.3
147	ICP-MS	0.951	49.7	5.14	9.18	15.3
200	ICP-MS	0.8	48.4	5.2	9.1	14.9
293	ICP-MS	1.03	52.94	5.58	9.93	16.34
343	ASV-LeadCare	<1.9	54.7	3.8	9.0	15.6
391	ETAAS-Z	0.92	41.45 ↓	3.795	6.98 ↓	12.817 ↓
399	DRC/CC-ICP-MS	0.964	52.4	5.41	10.0	16.3
401	DRC/CC-ICP-MS	0.8	49.3	5.0	9.3	15.1
597	DRC/CC-ICP-MS	1.30	61.1 ↑	6.68	12.2 ↑	18.4 ↑
598	ICP-MS	0.877	48.8	5.25	9.08	14.7
599	DRC/CC-ICP-MS	1.14	57.5 ↑	5.95	6.35 ↓	11.1 ↓
605	ICP-MS	1.00	53.4	5.09	9.68	16.2
606	DRC/CC-ICP-MS	1.09	52.0	5.23	9.43	15.8
686	ICP-MS	<1.0	52.1	5.32	9.82	16.2

Based on the grading criteria for Pb in Whole Blood, 89% of results were satisfactory, with 3 of the 17 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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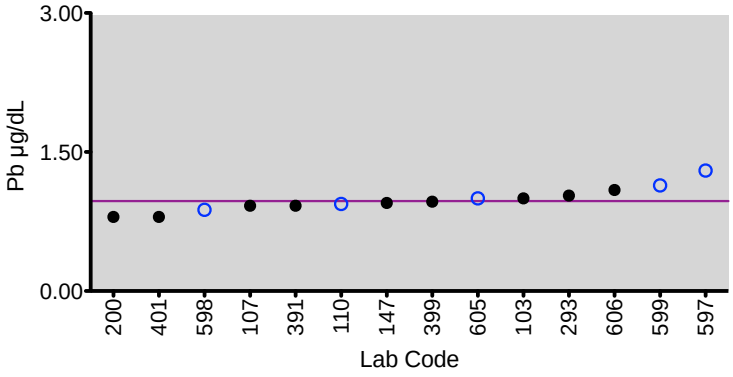
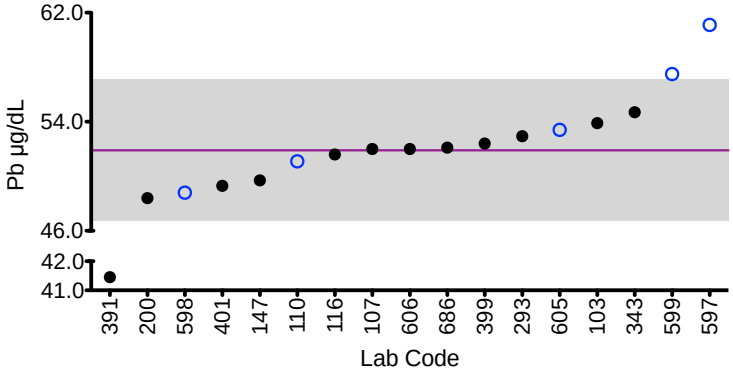
Results for Event #3, 2017: Summary Figures

Whole Blood Pb

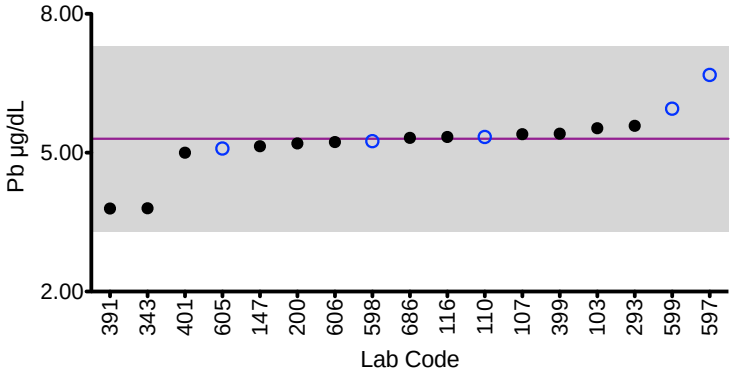
BE17-11



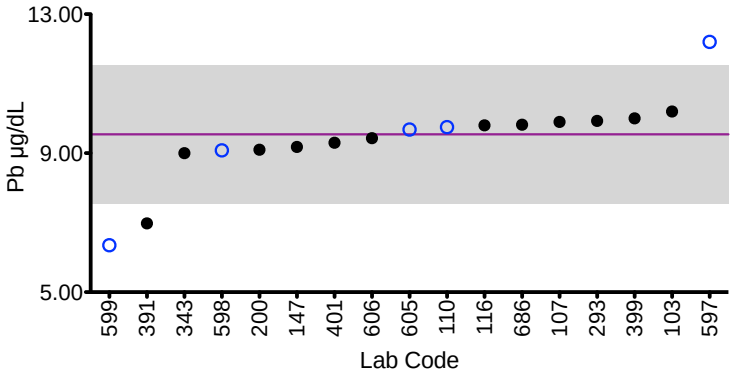
BE17-12



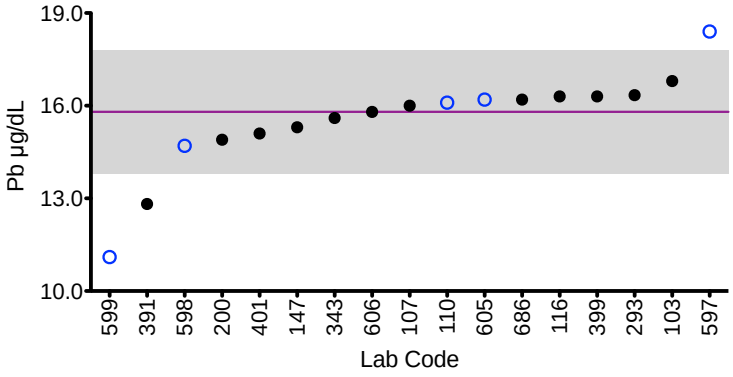
BE17-13



BE17-14



BE17-15



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:

±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 #3, 2017:
Laboratory Data and Summary Statistics

Whole Blood Ba (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
110	ICP-MS	3.6	2.1	10.9	6.3	0.5
147	ICP-MS	3.71	1.95	10.6	5.56	0.720
597	DRC/CC-ICP-MS	4.36	2.41	13.2	7.53	0.75
598	ICP-MS	4.08	3.49	12.20	6.31	1.40
599	DRC/CC-ICP-MS	3.84	1.95	11.27	9.03	*6.83
Summary Statistics						
		BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Arithmetic Mean ($\bar{x}$)		3.9	2.4	11.6	6.9	0.8
Arithmetic SD (s)		0.3	0.6	1.1	1.4	0.4
Arithmetic RSD (%)		7.7	25	9.5	20.3	50
Number of Sample Measurements (N)		5	5	5	5	4

*Denotes a statistical Outlier.

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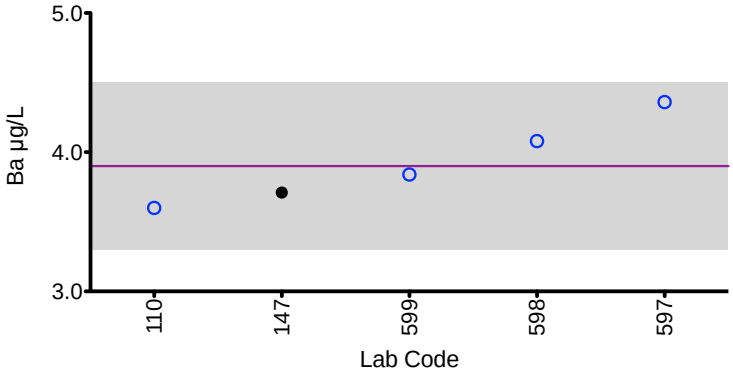
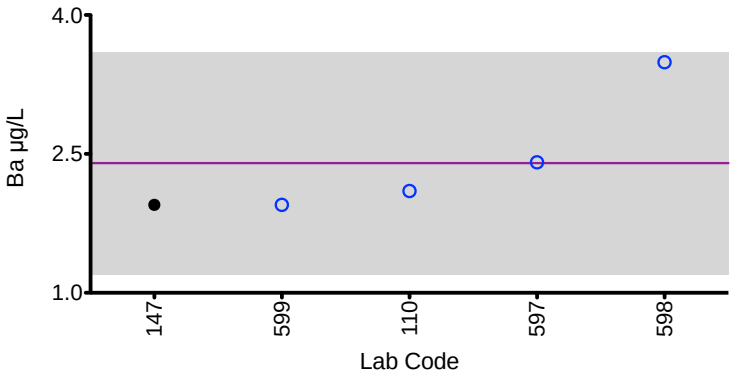
Results for Event #3, 2017: Summary Figures

Whole Blood Ba

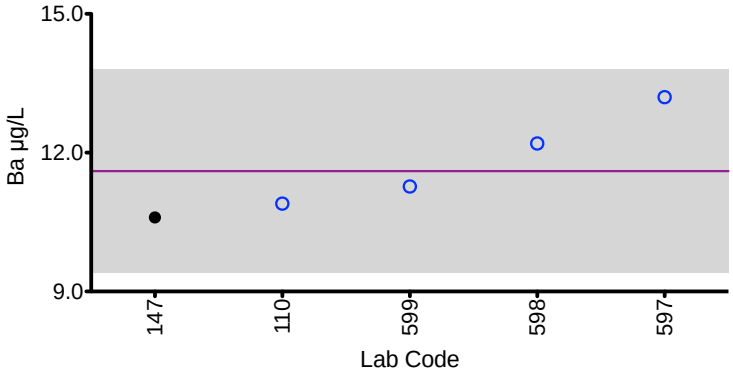
BE17-11



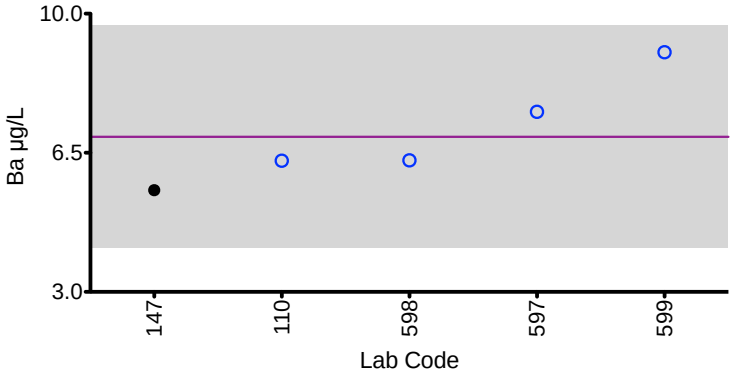
BE17-12



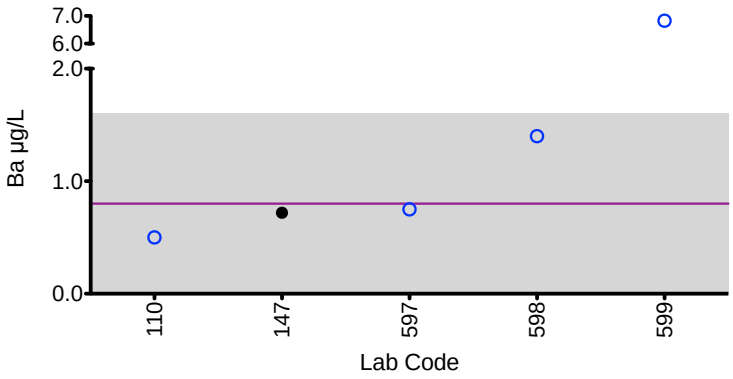
BE17-13



BE17-14



BE17-15



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 #3, 2017:
Laboratory Data and Summary Statistics

Whole Blood Cu (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
110	ICP-MS	901	2220	1710	740	2970
147	ICP-MS	947	2224	1677	731	2891
597	DRC/CC-ICP-MS	1170	2780	2150	961	3590
598	ICP-MS	868	2128	1693	719	2740
599	DRC/CC-ICP-MS	992	2393	1938	*2076	*987
Summary Statistics						
		BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Arithmetic Mean ($\bar{x}$)		976	2349	1834	788	3048
Arithmetic SD (s)		118	259	207	116	374
Arithmetic RSD (%)		12.1	11	11.3	14.7	12.3
Number of Sample Measurements (N)		5	5	5	4	4

*Denotes a statistical Outlier.

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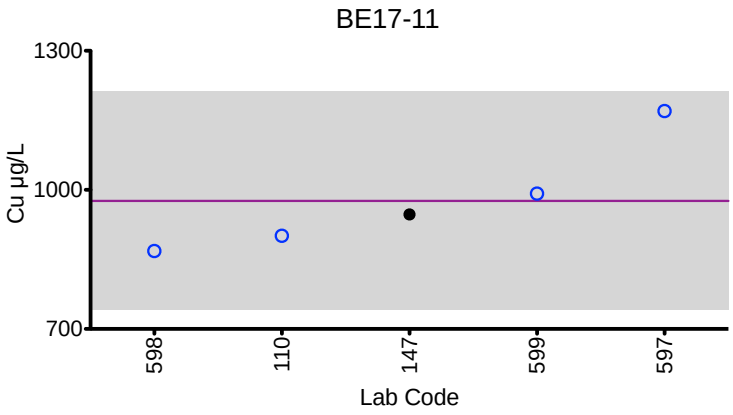
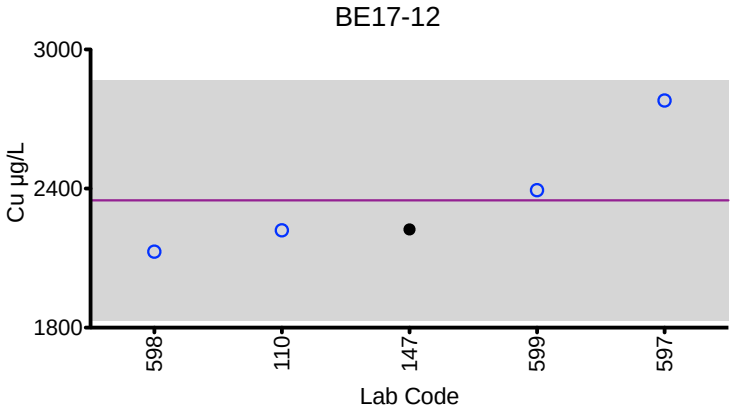
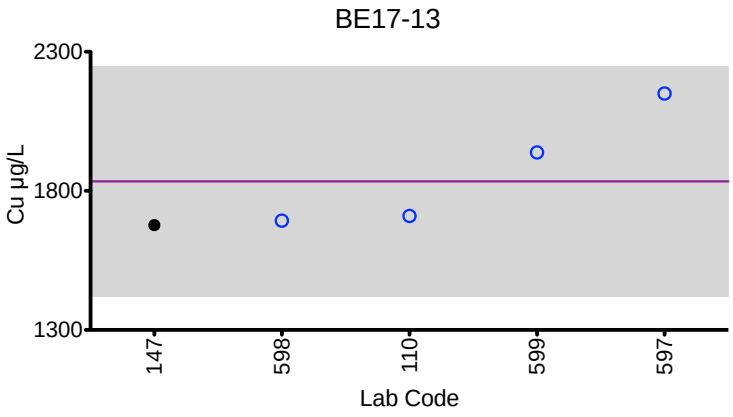
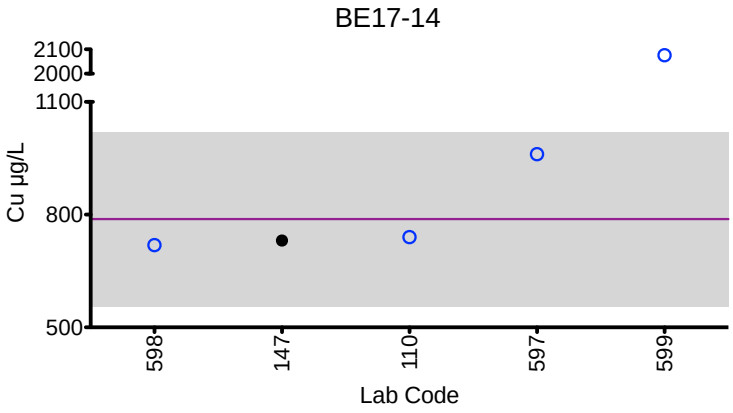
Results for Event #3, 2017: Summary Figures

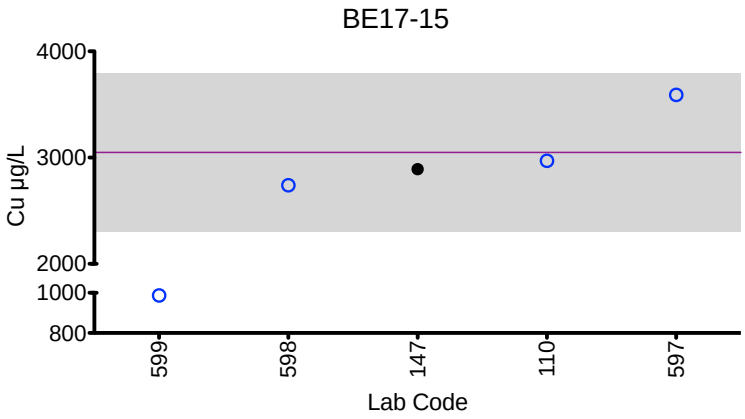
Whole Blood Cu











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 #3, 2017:
Laboratory Data and Summary Statistics

Whole Blood Sb (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
103	DRC/CC-ICP-MS	<0.0750	<0.258	2.68	5.65	1.15
110	ICP-MS	0.01	0.27	2.80	5.97	1.21
147	ICP-MS	< 0.0645	0.201	2.46	5.13	1.02
293	ICP-MS	0.04	0.21	2.56	5.13	1.14
597	DRC/CC-ICP-MS	0.076	0.326	3.24	6.60	1.29
598	ICP-MS	0.07	0.32	3.27	6.33	1.30
Summary Statistics						
		BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Arithmetic Mean ($\bar{x}$)		00	0.27	2.84	5.8	1.19
Arithmetic SD (s)		00	0.06	0.34	0.61	0.11
Arithmetic RSD (%)		?	22.2	12	10.5	9.2
Number of Sample Measurements (N)		NA	5	6	6	6

*Denotes a statistical Outlier.

Statistics for BE17-11 were not calculated based on a lack of consensus among participating laboratories.

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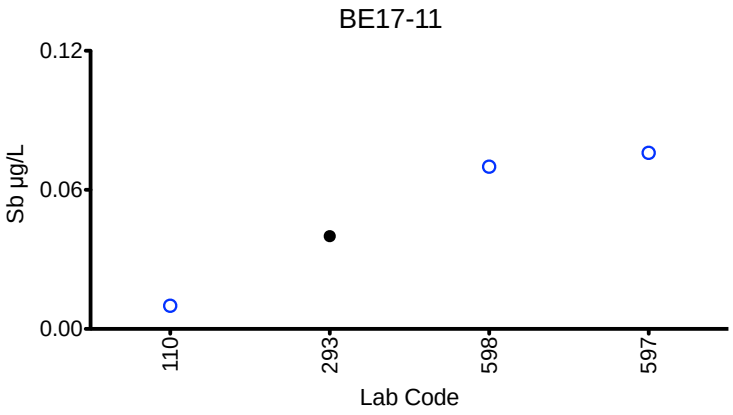
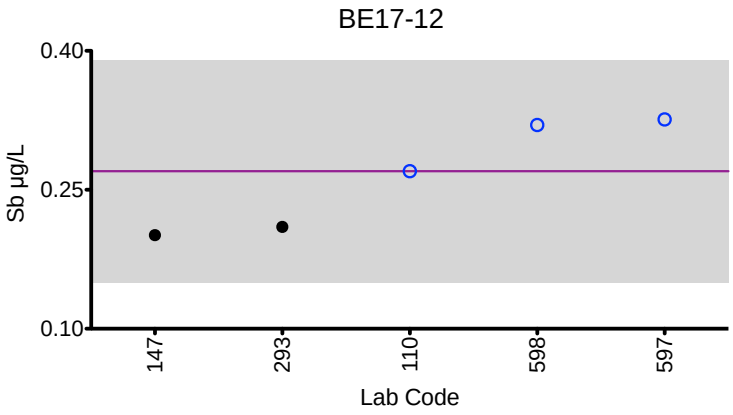
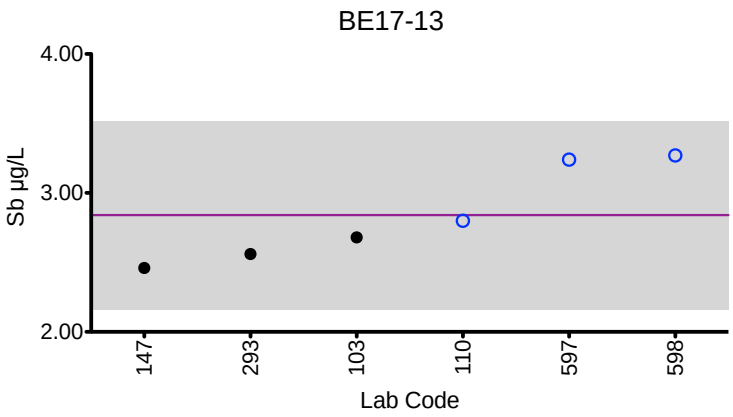
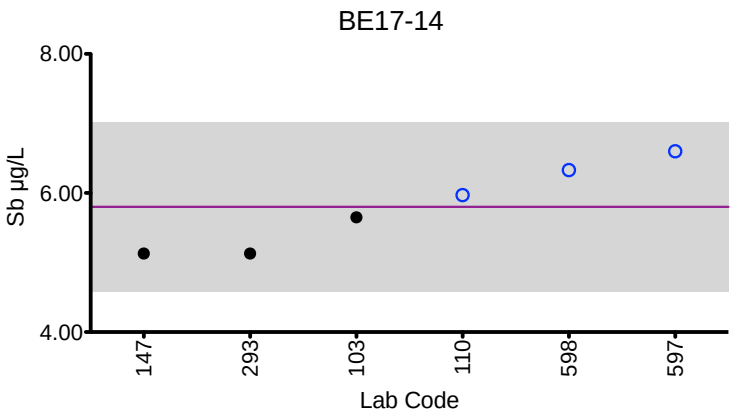
Results for Event #3, 2017: Summary Figures

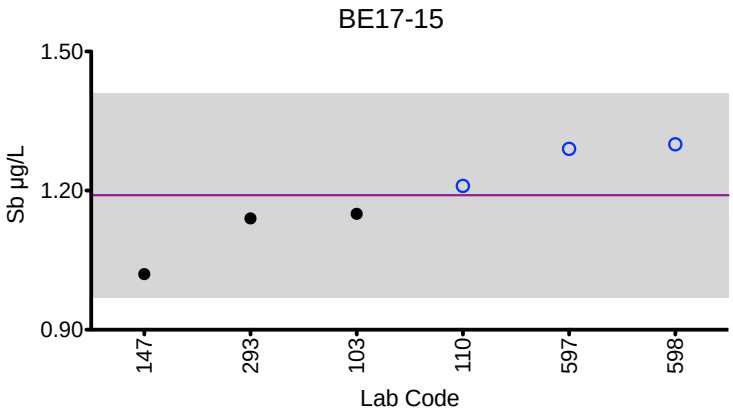
Whole Blood Sb











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 #3, 2017:
Laboratory Data and Summary Statistics

Whole Blood Se (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
103	DRC/CC-ICP-MS	207	180	329	381	280
107	DRC/CC-ICP-MS	190	180	320	370	280
110	DRC/CC-ICP-MS	178	158	292	347	253
147	ICP-MS	188	164	290	325	246
399	DRC/CC-ICP-MS	185	165	304	355	259
401	DRC/CC-ICP-MS	176	159	274	328	242
597	DRC/CC-ICP-MS	238	217	398	471	320
598	DRC/CC-ICP-MS	216	193	375	428	313
Summary Statistics						
		BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Arithmetic Mean ($\bar{x}$)		197	177	323	376	274
Arithmetic SD (s)		21	20	43	51	30
Arithmetic RSD (%)		10.7	11.3	13.3	13.6	10.9
Number of Sample Measurements (N)		8	8	8	8	8

*Denotes a statistical Outlier.

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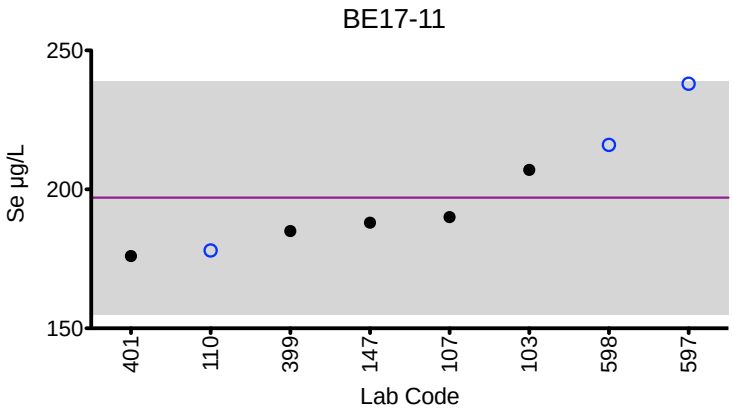
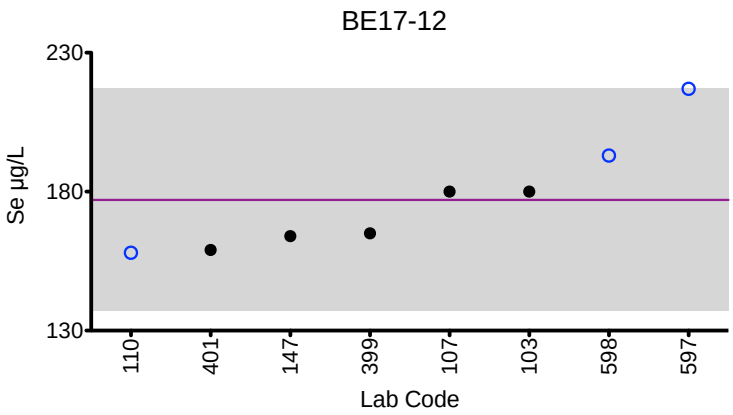
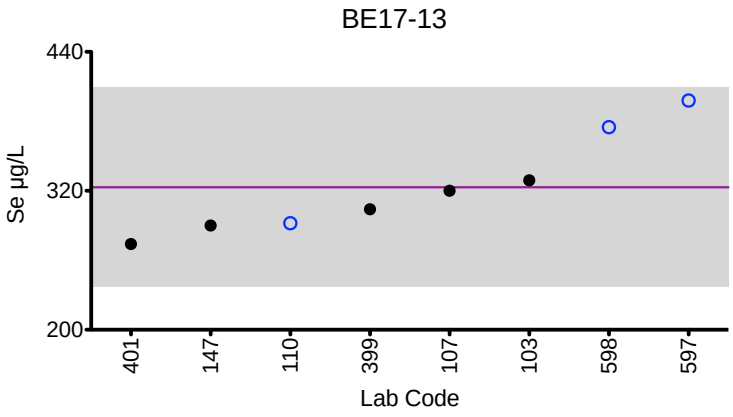
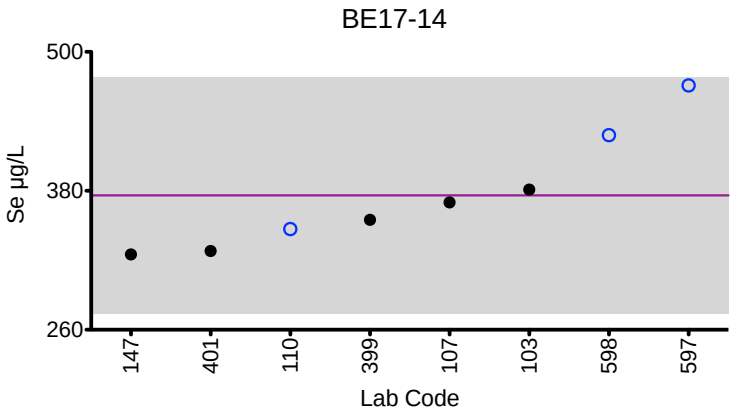
Results for Event #3, 2017: Summary Figures

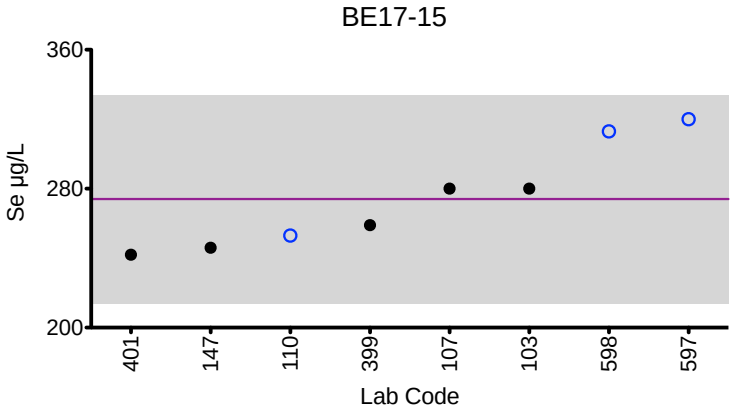
Whole Blood Se











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 #3, 2017:
Laboratory Data and Summary Statistics

Whole Blood Tl (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
103	DRC/CC-ICP-MS	0.666	0.0600	2.17	0.793	0.140
110	ICP-MS	0.70	0.03	2.12	0.80	0.13
147	ICP-MS	0.658	< 0.0348	2.02	0.754	0.130
293	ICP-MS	0.65	0.02	2.07	0.78	0.14
597	DRC/CC-ICP-MS	0.749	0.074	2.44	0.924	0.175
598	ICP-MS	0.70	*0.38	2.38	0.91	0.23
Summary Statistics						
		BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Arithmetic Mean ($\bar{x}$)		0.69	00	2.2	0.83	0.16
Arithmetic SD (s)		0.04	00	0.17	0.07	0.04
Arithmetic RSD (%)		5.8	?	7.7	8.4	25
Number of Sample Measurements (N)		6	NA	6	6	6

*Denotes a statistical Outlier.

Statistics for BE17-12 were not calculated based on a lack of consensus among participating laboratories.

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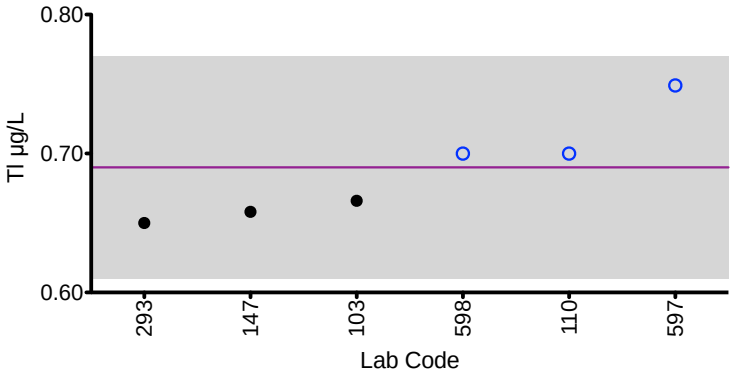
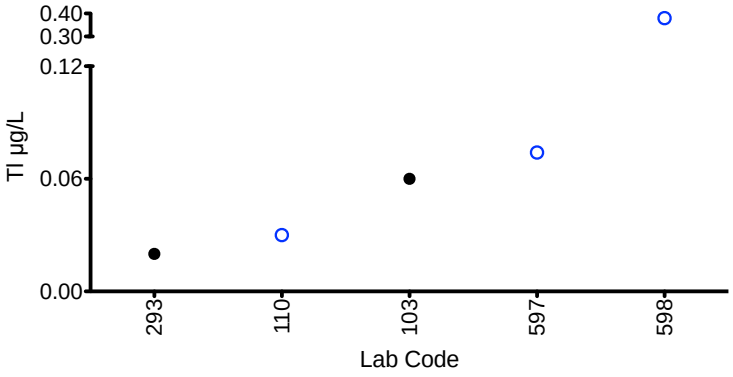
Results for Event #3, 2017: Summary Figures

Whole Blood Tl

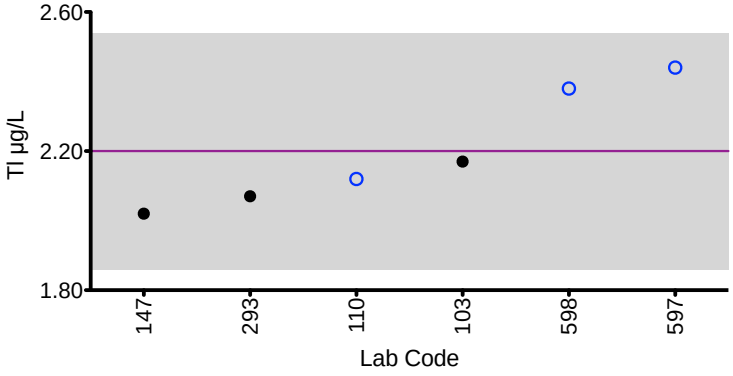
BE17-11



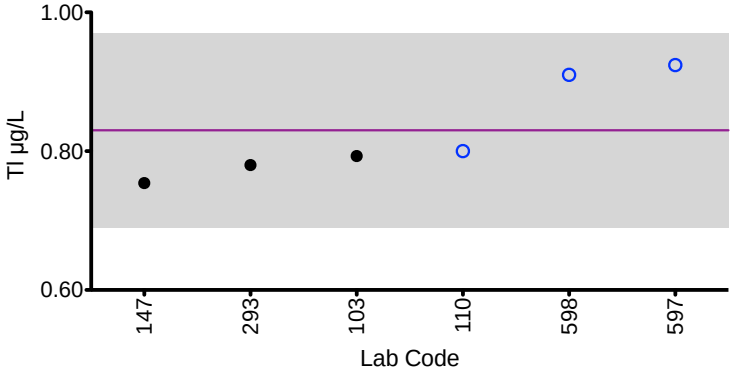
BE17-12



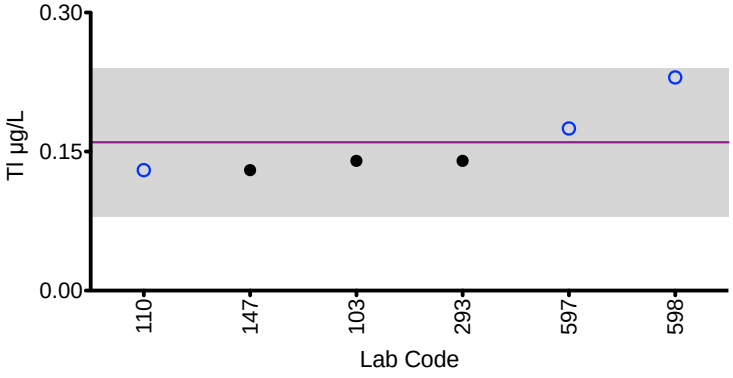
BE17-13



BE17-14



BE17-15



Legend:

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Whole Blood V (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
110	DRC/CC-ICP-MS	2.1	1.4	5.3	0.6	0.5
147	DRC/CC-ICP-MS	2.40	1.36	5.41	0.607	0.332
293	ICP-MS	2.4	1.35	5.56	0.68	0.45
597	DRC/CC-ICP-MS	2.49	1.36	6.27	0.690	0.379
598	DRC/CC-ICP-MS	2.26	1.40	6.04	0.73	0.34
Summary Statistics						
		BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Arithmetic Mean ($\bar{x}$)		2.33	1.37	5.72	0.66	0.4
Arithmetic SD (s)		0.15	0.02	0.42	0.06	0.07
Arithmetic RSD (%)		6.4	1.5	7.3	9.1	17.5
Number of Sample Measurements (N)		5	5	5	5	5

*Denotes a statistical Outlier.

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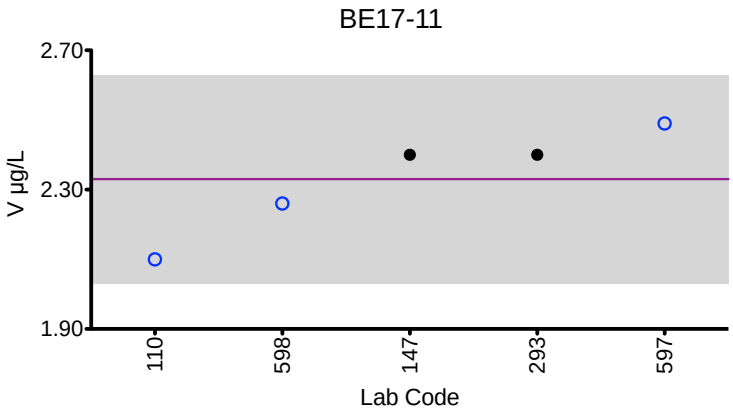
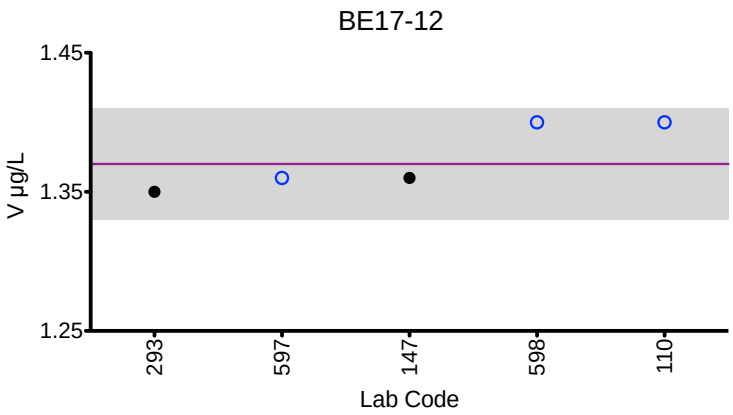
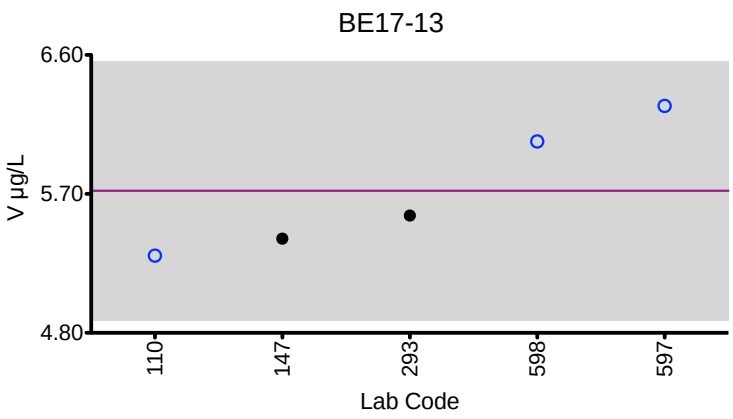
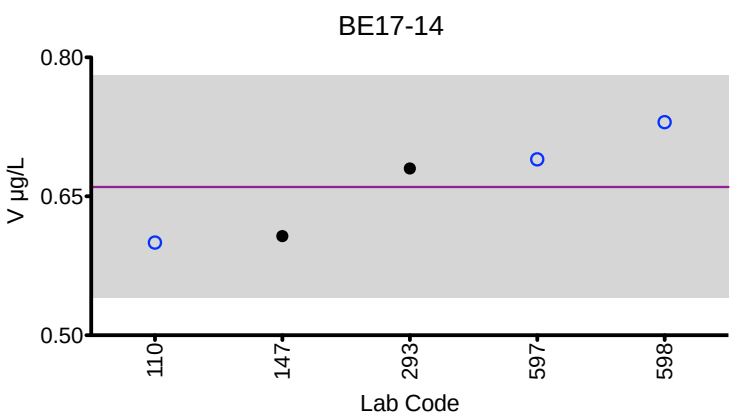
Results for Event #3, 2017: Summary Figures

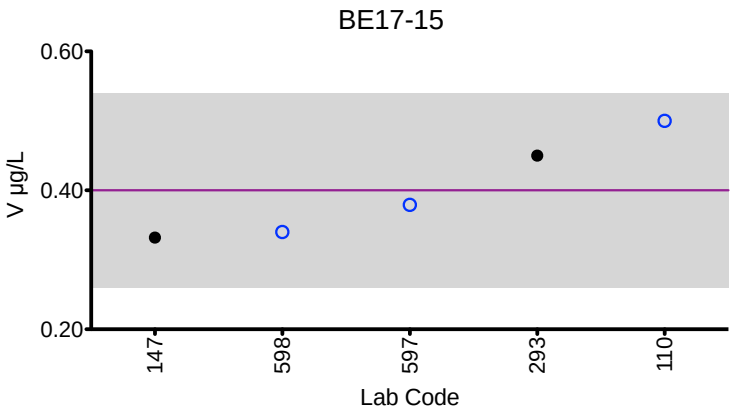
Whole Blood V











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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Whole Blood Zn (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
110	ICP-MS	5090	5940	8030	6130	6490
147	ICP-MS	4954	5667	7516	5621	6020
597	DRC/CC-ICP-MS	6520	7340	10100	7800	7820
598	ICP-MS	5018	5679	7761	6155	5851
599	DRC/CC-ICP-MS	5816	6519	9264	9965	8475

Summary Statistics					
	BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Arithmetic Mean ($\bar{x}$)	5480	6229	8534	7134	6931
Arithmetic SD (s)	678	711	1104	1783	1158
Arithmetic RSD (%)	12.4	11.4	12.9	25	16.7
Number of Sample Measurements (N)	5	5	5	5	5

*Denotes a statistical Outlier.

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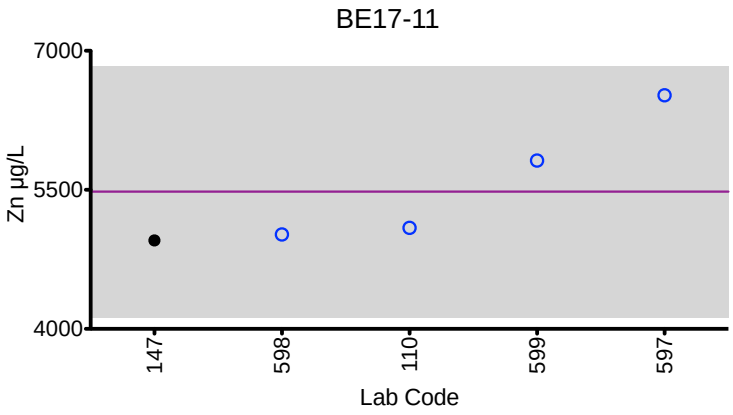
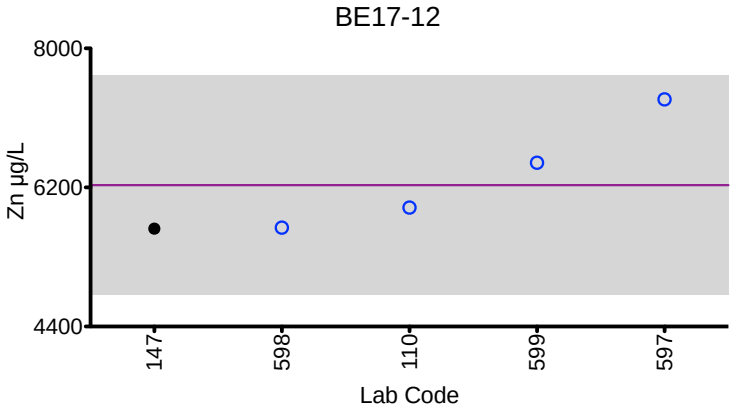
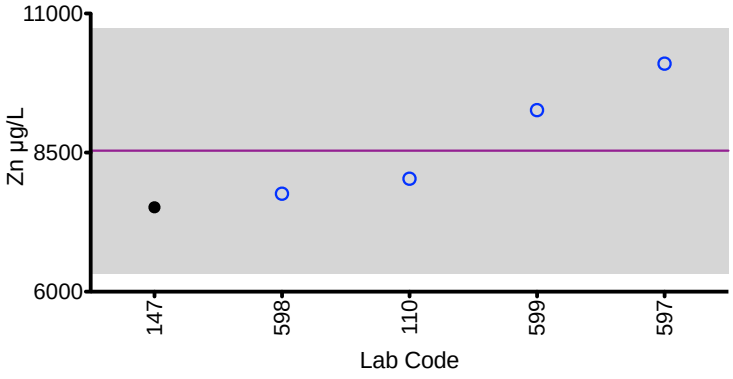
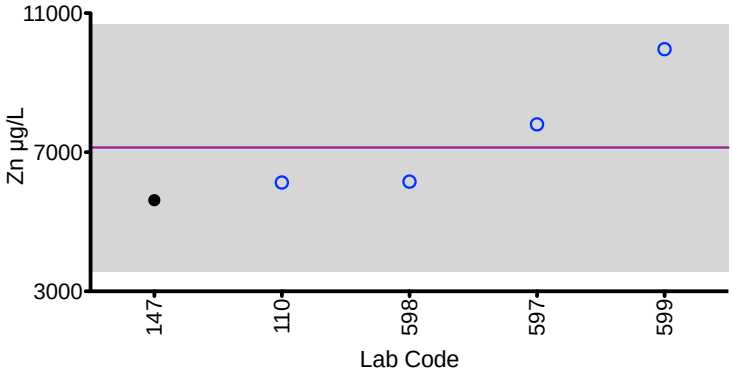
Results for Event #3, 2017: Summary Figures

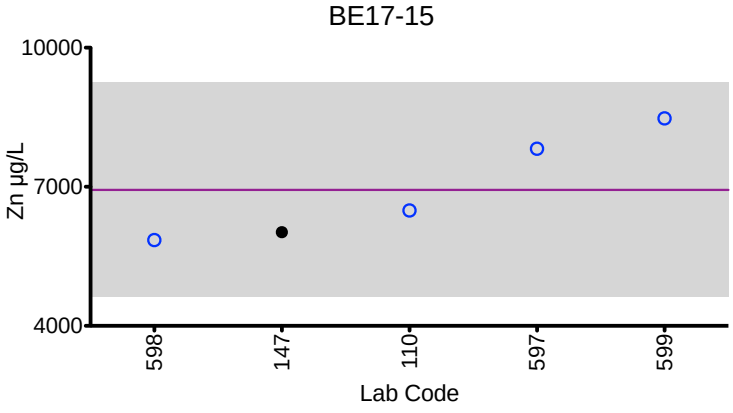
Whole Blood Zn











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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Whole Blood Be (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
110	ICP-MS	1.08	0.77	4.37	3.18	2.25
147	ICP-MS	<1.17	<1.17	4.38	3.02	1.87
293	ICP-MS	1.1	0.7	4.2	2.9	1.9
598	ICP-MS	1.33	1.21	4.46	3.35	2.47
Summary Statistics						
		BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Arithmetic Mean ($\bar{x}$)		1.2	0.9	4.4	3.1	2.1
Arithmetic SD (s)		0.1	0.3	0.1	0.2	0.3
Arithmetic RSD (%)		8.3	33.3	2.3	6.5	14.3
Number of Sample Measurements (N)		3	3	4	4	4

*Denotes a statistical Outlier.

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Whole Blood Cs (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
110	ICP-MS	1.8	2.3	1.6	2.1	1.8
597	DRC/CC-ICP-MS	2.12	2.41	1.90	2.52	1.95
598	ICP-MS	1.79	2.26	1.78	2.17	1.81
Summary Statistics						
		BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Arithmetic Mean ($\bar{x}$)		1.9	2.3	1.8	2.3	1.9
Arithmetic SD (s)		0.2	0.1	0.2	0.2	0.1
Arithmetic RSD (%)		10.5	4.3	11.1	8.7	5.3
Number of Sample Measurements (N)		3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Whole Blood Mo (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
103	DRC/CC-ICP-MS	2.87	7.76	13.0	0.224	3.86
147	ICP-MS	2.92	7.24	12.2	0.368	3.66
597	DRC/CC-ICP-MS	3.30	8.90	15.8	0.523	4.50
598	DRC/CC-ICP-MS	3.84	9.14	16.29	0.87	5.11

Summary Statistics					
	BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Arithmetic Mean ($\bar{x}$)	3.23	8.26	14.3	NA	4.28
Arithmetic SD (s)	0.45	0.91	2.0	NA	0.66
Arithmetic RSD (%)	13.9	11.0	14.0	NA	15.4
Number of Sample Measurements (N)	4	4	4	NA	4

*Denotes a statistical Outlier.

Statistics for BE17-14 were not calculated based on a lack of consensus among participating laboratories.

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Whole Blood Ni (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
110	DRC/CC-ICP-MS	5.5	4.1	10.2	2.1	6.4
147	ICP-MS	5.93	4.13	10.5	1.66	6.40
598	ICP-MS	4.70	*8.23	11.7	1.33	6.84
599	DRC/CC-ICP-MS	6.57	3.29	11.6	*13.5	*2.70
Summary Statistics						
		BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Arithmetic Mean ($\bar{x}$)		5.7	3.8	11	1.7	6.6
Arithmetic SD (s)		0.8	0.5	0.8	0.4	0.3
Arithmetic RSD (%)		14	13.2	7.3	23.5	4.5
Number of Sample Measurements (N)		4	3	4	3	3

*Denotes a statistical Outlier.

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Whole Blood Pt (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
110	ICP-MS	0.5	7.2	2.2	1.3	0.3
598	ICP-MS	0.78	7.02	2.54	1.35	0.51
Summary Statistics						
		BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Arithmetic Mean ($\bar{x}$)		0.64	7.1	2.4	1.3	0.41
Arithmetic SD (s)		0.20	0.1	0.2	<0.1	0.15
Arithmetic RSD (%)		31.3	1.4	8.3	<0.1	36.6
Number of Sample Measurements (N)		2	2	2	2	2

*Denotes a statistical Outlier.

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Whole Blood Sn (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
110	ICP-MS	1.5	3.2	5.8	2.4	0.8
147	ICP-MS	1.25	2.87	5.19	2.02	0.591
597	DRC/CC-ICP-MS	1.71	3.79	6.83	2.91	0.837
598	ICP-MS	1.73	3.96	7.06	2.91	1.15
Summary Statistics						
		BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Arithmetic Mean ($\bar{x}$)		1.5	3.5	6.2	2.6	0.8
Arithmetic SD (s)		0.2	0.5	0.9	0.4	0.2
Arithmetic RSD (%)		13.3	14.3	14.5	15.4	25.0
Number of Sample Measurements (N)		4	4	4	4	4

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Whole Blood U (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
103	DRC/CC-ICP-MS	0.0587	0.0193	0.107	0.0714	0.0823
110	ICP-MS	0.060	0.024	0.125	0.079	0.086
147	ICP-MS	0.0540	0.0219	0.112	0.0645	0.0786
598	ICP-MS	*0.10	*0.14	*0.14	*0.09	*0.11
Summary Statistics						
		BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Arithmetic Mean ($\bar{x}$)		0.058	0.022	0.110	0.072	0.082
Arithmetic SD (s)		0.003	0.002	0.009	0.007	0.004
Arithmetic RSD (%)		5.5	10.8	8.1	10.1	4.5
Number of Sample Measurements (N)		3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Whole Blood W (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
110	ICP-MS	0.30	0.05	1.17	0.20	0.41
200	ICP-MS	0.39	0.08	1.25	0.23	0.48
598	ICP-MS	*1.00	*0.70	1.90	*0.60	*0.90

Summary Statistics					
	BE17-11	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
Arithmetic Mean ($\bar{x}$)	0.35	0.07	1.4	0.22	0.45
Arithmetic SD (s)	0.06	0.02	0.4	0.02	0.05
Arithmetic RSD (%)	17.1	28.6	27.8	9.1	11.1
Number of Sample Measurements (N)	2	2	3	2	2

*Denotes a statistical Outlier.

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Results for Event #3, 2017:
Additional Elements in Whole Blood

Whole Blood Ag (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
147	ICP-MS	< 0.205	< 0.205	< 0.205	< 0.205	< 0.205

Whole Blood Al (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
147	ICP-MS	<9.17	<9.17	<9.17	<9.17	<9.17
597	DRC/CC-ICP-MS	16.4	16.7	14.2	19.0	20.6

Whole Blood Bi (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
147	ICP-MS	< 0.0836	< 0.0836	< 0.0836	< 0.0836	0.196

Whole Blood I (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
147	ICP-MS	31.8	28.2	29.1	20.9	30.8

Whole Blood Li (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
147	ICP-MS	0.840	2.53	0.434	0.701	0.355

Whole Blood Mg (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
597	DRC/CC-ICP-MS	39100	35400	35900	39600	39400

Whole Blood Sr (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
103	DRC/CC-ICP-MS	15.3	37.6	17.2	21.7	16.8

Whole Blood Te (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
147	ICP-MS	< 0.128	< 0.128	< 0.128	< 0.128	< 0.128

Whole Blood Th (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
147	ICP-MS	< 0.0148	< 0.0148	< 0.0148	< 0.0148	< 0.0148

Whole Blood Ti (µg/L)						
Lab Code	**Method**	**BE17-11**	**BE17-12**	**BE17-13**	**BE17-14**	**BE17-15**
200	DRC/CC-ICP-MS	5.5	1.7	10.3	3.5	2.2

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Event #3, 2017

Trace Elements in Urine

Wadsworth Center
NEW YORK STATE DEPARTMENT OF HEALTH
Trace Elements Laboratory

Event #3, 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, 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.

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Results for Event #3, 2017: Summary Statistics

Urine As (µg/L)					
	UE17-11	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
Target (Robust Mean (x*))	85.5	225	20.8	12	68.1
Upper Limit	103	270	26.8	18	82
Lower Limit	68	180	14.8	6	54
Robust SD (s*)	4.9	14	1.6	1.1	4.0
Robust RSD (%)	5.7	6.2	7.7	9.2	5.9
Number of Sample Measurements (N)	21	21	21	21	21
Standard Uncertainty (*u*)	1.350	3.730	0.442	0.288	1.100

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 #3, 2017:
Performance of Participating Laboratories

Urine As (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
	Target	**85.5**	**225**	**20.8**	**12**	**68.1**
103	DRC/CC-ICP-MS	88.0	224	20.7	12.1	68.0
107	DRC/CC-ICP-MS	83	220	20	11	65
110	DRC/CC-ICP-MS	92.9	235	22.1	12.7	72.2
116	DRC/CC-ICP-MS	88.2	229	20.8	11.8	67.7
147	ICP-MS	83.1	210	19.9	11.2	65.5
200	ICP-MS	84.0	230.0	25.5	18.8 ↑	80.3
293	ICP-MS	83.5	219.2	19.8	11.6	68.6
324	ICP-MS	88.48	226.89	20.82	12.00	69.12
391	DRC/CC-ICP-MS	75.2	194.2	19.0	10.5	57.9
399	DRC/CC-ICP-MS	86.8	218	21.0	11.9	67.1
401	DRC/CC-ICP-MS	92.3	230	21.0	12.7	69.8
597	DRC/CC-ICP-MS	82.1	264	21.2	12.5	63.2
598	DRC/CC-ICP-MS	86.3	242.1	22.8	12.4	73.4
599	DRC/CC-ICP-MS	52.6 ↓	160.4 ↓	10.0 ↓	4.19 ↓	54.8
604	DRC/CC-ICP-MS	77.9	209	19.0	11.1	65.9
605	ICP-MS	81.3	211	19.6	11.2	65.2
606	DRC/CC-ICP-MS	91.9	251	22.2	12.7	73.1
630	ICP-MS	82.1	222.0	20.2	12.1	68.5
632	DRC/CC-ICP-MS	88.2	226	22.5	14.5	70.5
684	DRC/CC-ICP-MS	85.6	230.0	19.6	11.6	66.8
686	DRC/CC-ICP-MS	92.7	245	23.3	14.7	72.7

Based on the grading criteria for As in Urine, 95% of results were satisfactory, with 1 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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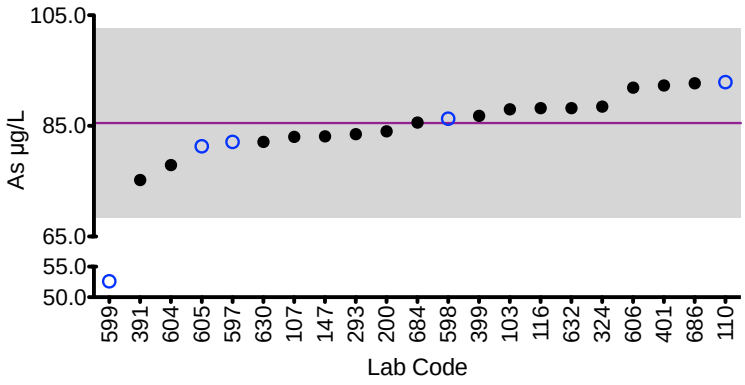
Results for Event #3, 2017: Summary Figures

Urine As

UE17-11



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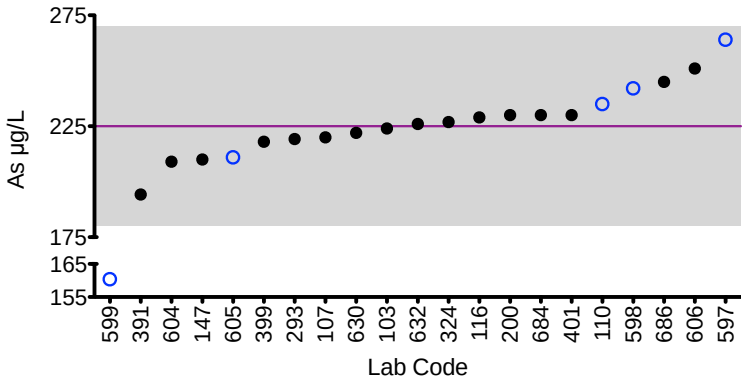

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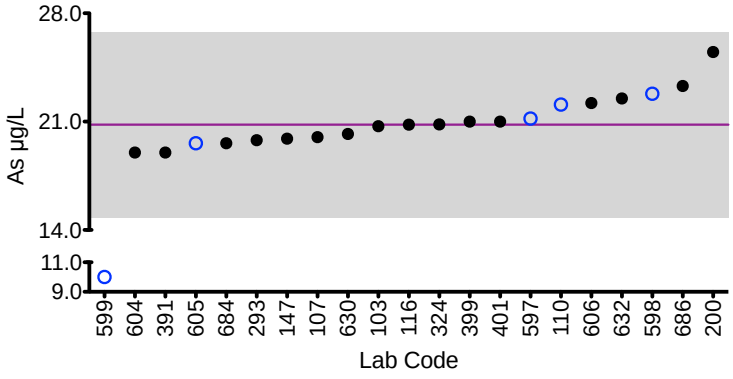

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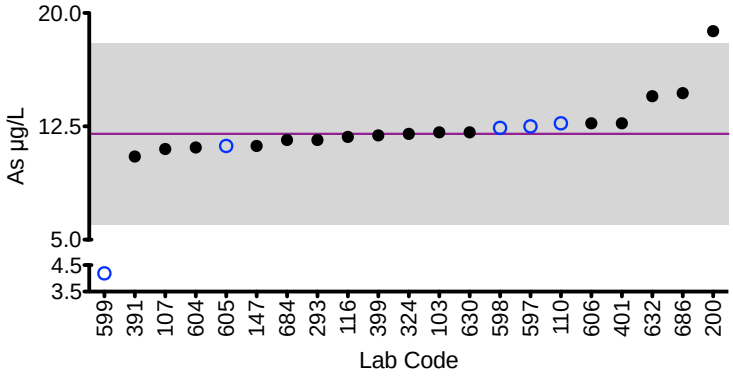
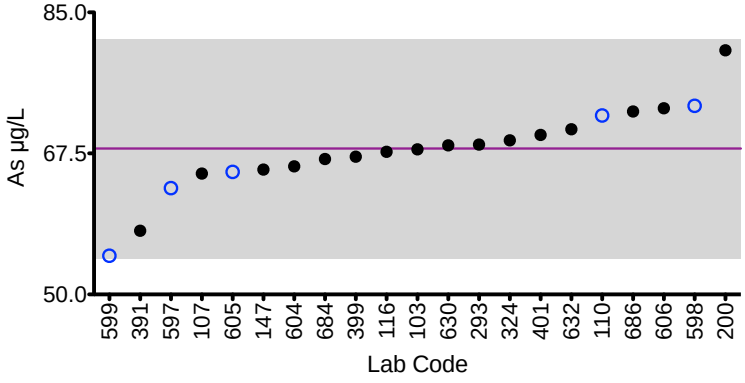


UE17-15



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 #3, 2017: Summary Statistics

Urine Ba (µg/L)					
	UE17-11	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
Target (Robust Mean (x*))	10.7	3.3	7.7	1.6	5.9
Upper Limit	12.8	4.3	9.2	2.6	7.1
Lower Limit	8.6	2.3	6.2	0.6	4.7
Robust SD (s*)	0.6	0.2	0.3	0.1	0.4
Robust RSD (%)	5.6	6.1	3.9	6.3	6.8
Number of Sample Measurements (N)	13	13	13	13	13
Standard Uncertainty (*u*)	0.209	0.074	0.120	0.041	0.124

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 #3, 2017:
Performance of Participating Laboratories

		Urine Ba (µg/L)				
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
	Target	**10.7**	**3.3**	**7.7**	**1.6**	**5.9**
107	ICP-MS	11	3.3	7.8	1.6	5.9
110	ICP-MS	10.9	3.2	7.5	1.6	5.8
116	DRC/CC-ICP-MS	10.4	3.12	7.47	1.49	5.79
147	ICP-MS	10.60	3.20	7.72	1.57	5.88
399	ICP-MS	10.8	3.29	7.82	1.64	6.11
597	DRC/CC-ICP-MS	9.64	3.57	7.48	1.47	5.16
598	ICP-MS	10.4	3.63	8.32	1.75	6.46
599	DRC/CC-ICP-MS	8.79	3.10	6.32	2.54	5.46
605	ICP-MS	10.30	3.13	7.48	1.52	5.74
606	DRC/CC-ICP-MS	10.9	3.64	7.36	1.21	5.70
607	ICP-MS	11.4	3.32	7.87	1.63	6.13
632	ICP-MS	11.5	3.45	7.94	1.59	6.29
686	ICP-MS	11.4	3.37	8.13	1.69	6.29

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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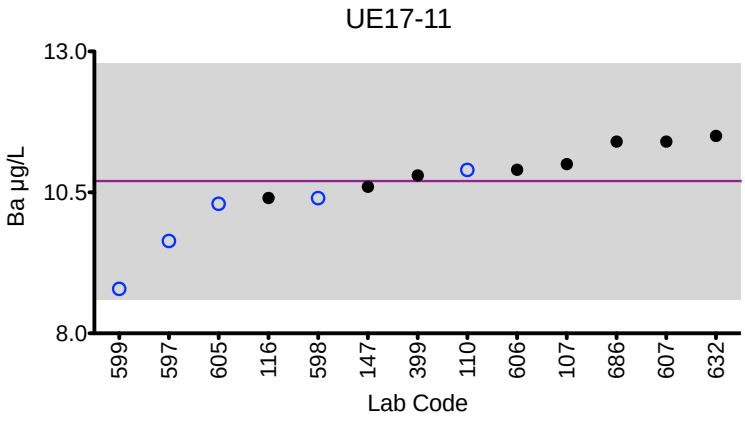
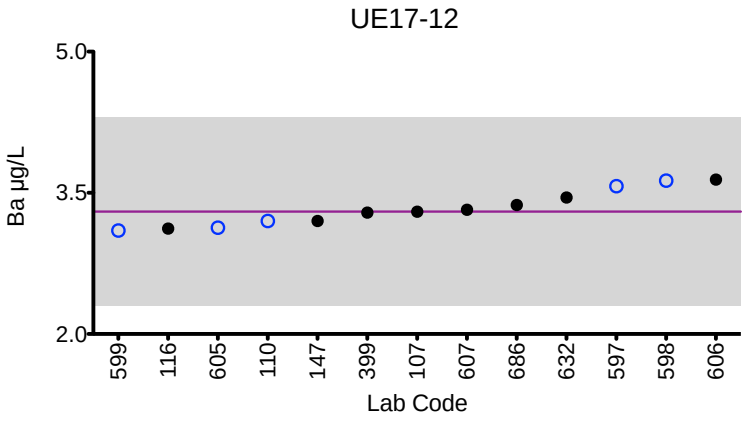
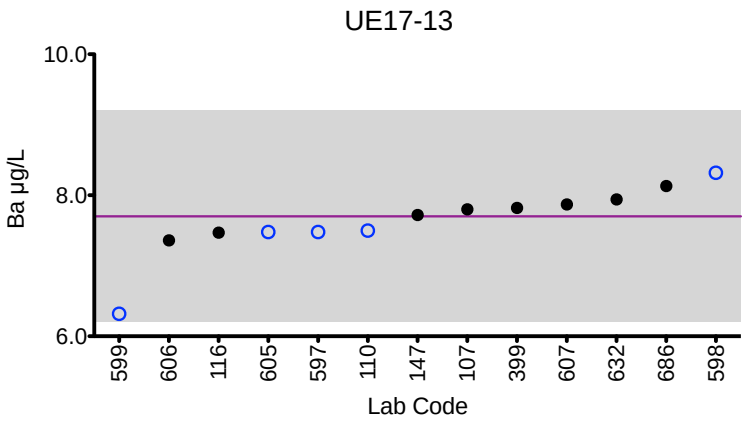
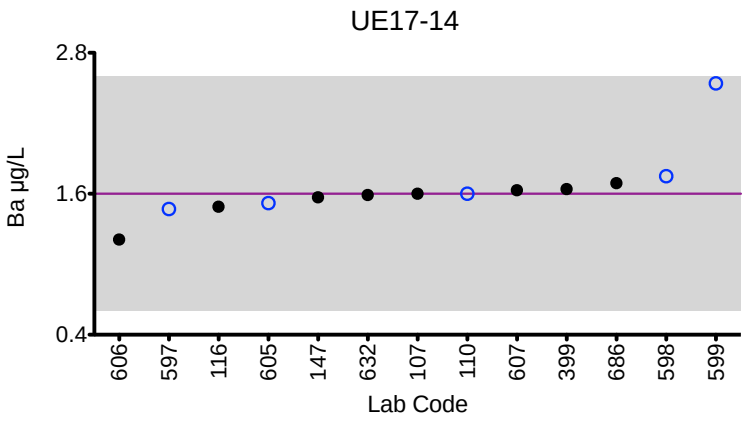
Results for Event #3, 2017: Summary Figures

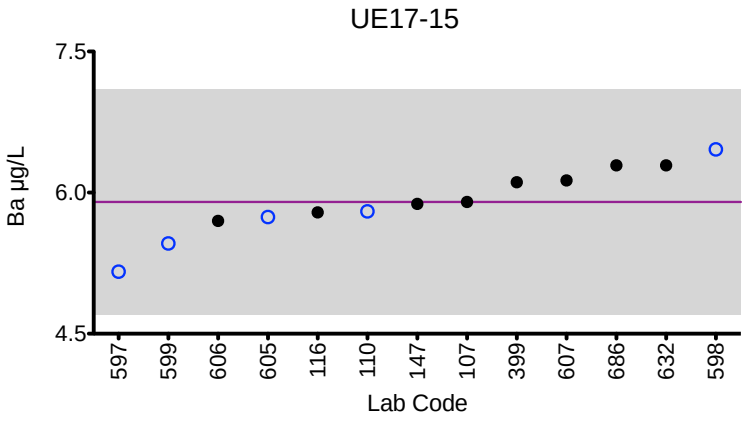
Urine Ba











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 #3, 2017: Summary Statistics

	Urine Be (µg/L)				
	UE17-11	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
Target (Robust Mean (x*))	1.8	2.8	4.7	0.5	1.3
Upper Limit	2.8	3.8	5.7	1.5	2.3
Lower Limit	0.8	1.8	3.7	0	0.3
Robust SD (s*)	0.1	0.2	0.3	0.02	0.1
Robust RSD (%)	5.6	7.1	6.4	4.0	7.7
Number of Sample Measurements (N)	12	12	12	11	12
Standard Uncertainty (*u*)	0.0480	0.0720	0.1210	0.0069	0.0310

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 #3, 2017:
Performance of Participating Laboratories

Urine Be (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
	Target	**1.8**	**2.8**	**4.7**	**0.5**	**1.3**
107	ICP-MS	2	3	4.9	0.51	1.3
110	ICP-MS	2.0	3.2	5.0	0.5	1.3
116	ICP-MS	1.74	2.66	4.62	0.436	1.17
147	ICP-MS	1.74	2.68	4.25	< 0.450	1.33
293	ICP-MS	1.84	2.85	4.59	0.50	1.33
399	ICP-MS	1.76	2.73	4.46	0.504	1.27
598	ICP-MS	1.74	2.89	5.15	0.49	1.45
599	DRC/CC-ICP-MS	1.18	2.20	3.27 ↓	1.62 ↑	0.829
605	ICP-MS	1.73	2.63	4.51	0.474	1.24
607	ICP-MS	1.96	2.97	4.93	0.559	1.42
632	ICP-MS	1.95	2.98	4.65	0.500	1.31
686	ICP-MS	1.88	2.88	4.78	0.536	1.38

Based on the grading criteria for Be in Urine, 97% 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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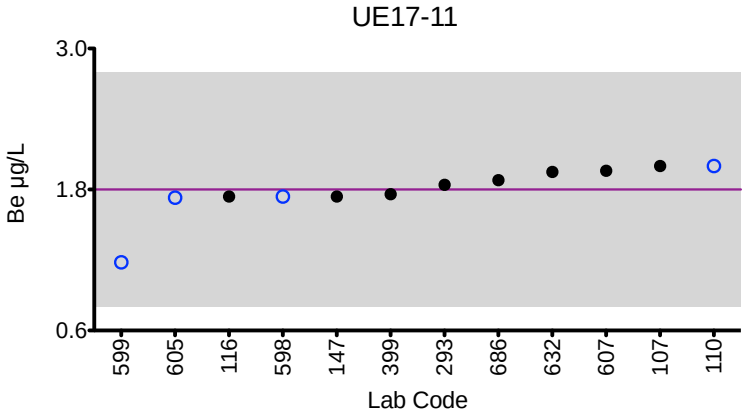
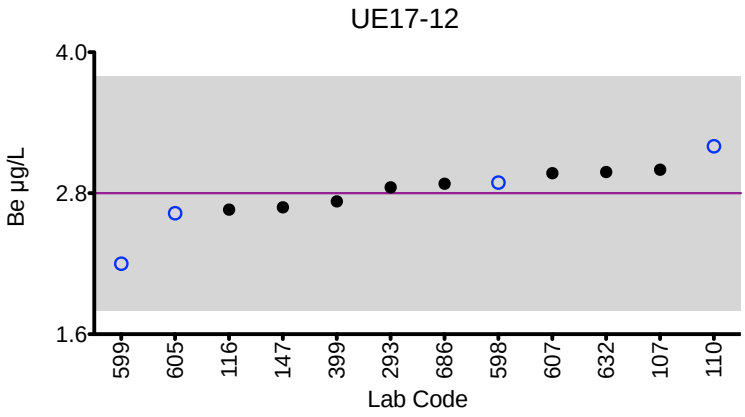
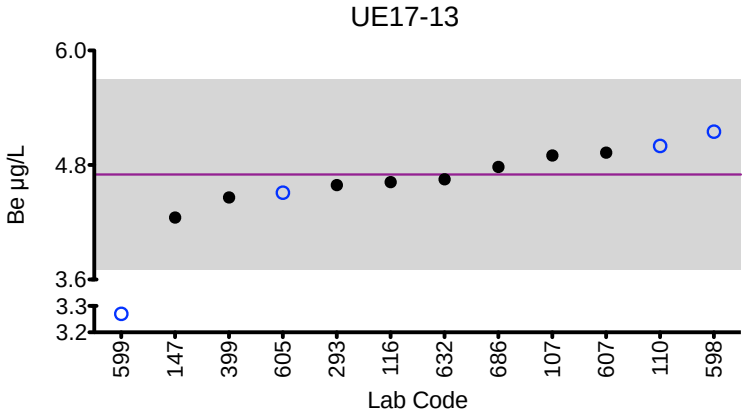
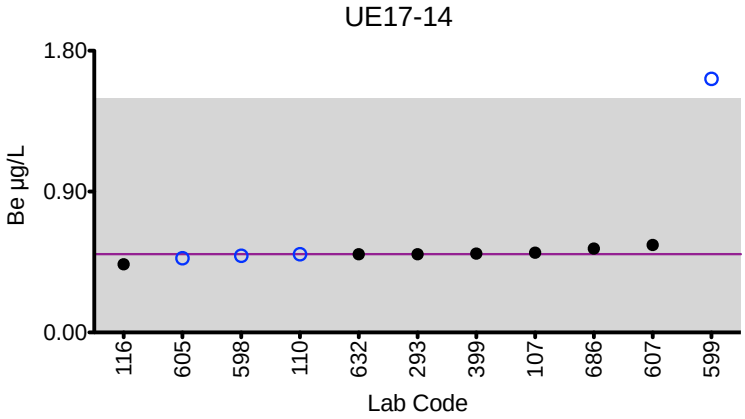
Results for Event #3, 2017: Summary Figures

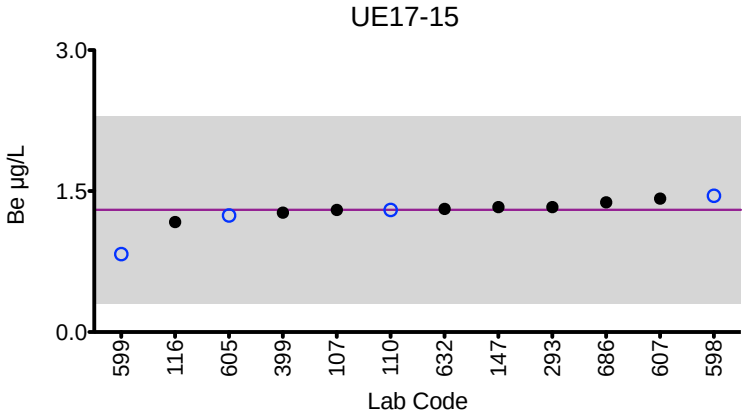
Urine Be











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 #3, 2017: Summary Statistics

	Urine Cd (µg/L)				
	UE17-11	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
Target (Robust Mean (x*))	2.63	1.65	4.47	0.71	1.21
Upper Limit	3.63	2.65	5.47	1.71	2.21
Lower Limit	1.63	0.65	3.47	0	0.21
Robust SD (s*)	0.09	0.13	0.17	0.07	0.23
Robust RSD (%)	3.4	7.9	3.8	9.8	19
Number of Sample Measurements (N)	20	20	20	19	20
Standard Uncertainty (*u*)	0.026	0.036	0.047	0.020	0.064

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 #3, 2017:
Performance of Participating Laboratories

		Urine Cd (µg/L)				
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
	Target	**2.63**	**1.65**	**4.47**	**0.71**	**1.21**
103	DRC/CC-ICP-MS	2.98	1.72	4.69	0.760	1.20
107	DRC/CC-ICP-MS	2.7	1.5	4.5	0.69	1
110	ICP-MS	2.56	1.39	4.25	0.61	0.84
116	DRC/CC-ICP-MS	2.63	1.59	4.53	0.623	1.18
147	ICP-MS	2.55	1.47	4.43	0.574	0.883
200	ICP-MS	2.80	1.80	4.40	0.70	1.30
293	ICP-MS	2.77	1.62	4.23	0.71	1.18
324	ICP-MS	2.56	1.61	4.34	<1	1.35
391	DRC/CC-ICP-MS	2.59	1.64	4.31	0.74	1.33
399	DRC/CC-ICP-MS	2.55	1.63	4.43	0.738	1.18
401	DRC/CC-ICP-MS	2.59	1.69	4.50	0.67	1.24
597	DRC/CC-ICP-MS	2.56	1.93	4.51	0.67	1.02
598	DRC/CC-ICP-MS	2.58	1.57	4.56	0.68	1.12
599	DRC/CC-ICP-MS	2.09	1.51	3.45 ↓	1.77 ↑	0.912
605	ICP-MS	2.67	1.65	4.51	0.761	1.30
606	DRC/CC-ICP-MS	2.56	1.61	4.38	0.672	1.13
607	ICP-MS	2.65	1.80	4.50	0.807	1.54
630	ICP-MS	2.69	1.71	4.72	0.79	1.37
632	DRC/CC-ICP-MS	2.71	1.74	4.63	0.727	1.50
686	ICP-MS	2.79	1.88	4.77	0.862	1.62

Based on the grading criteria for Cd in Urine, 98% of results were satisfactory, with 1 of the 20 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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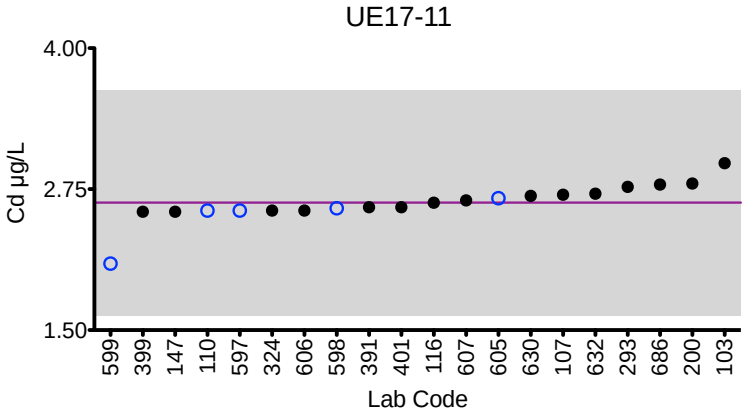
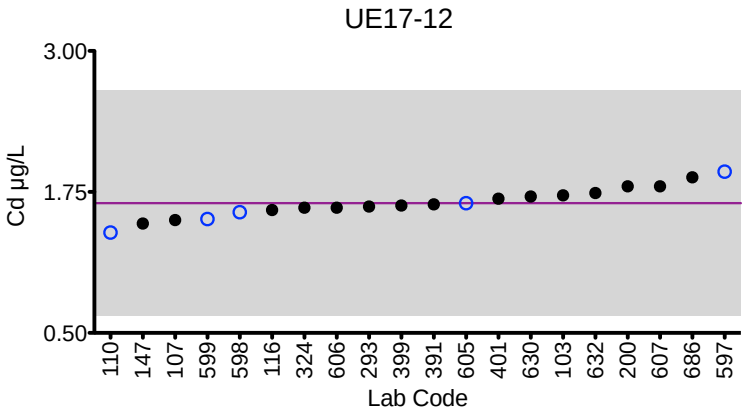
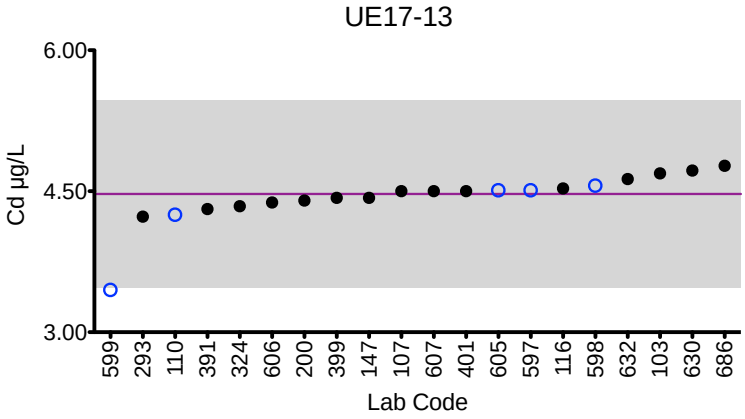
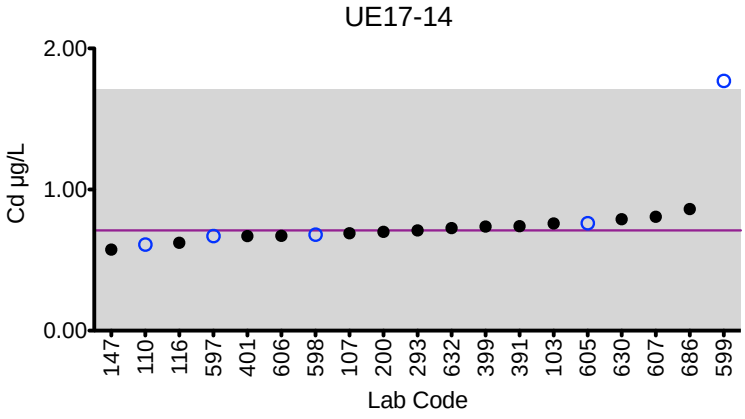
Results for Event #3, 2017: Summary Figures

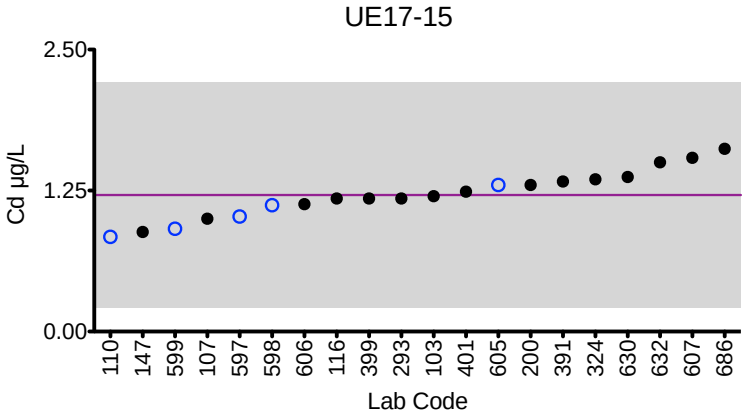
Urine Cd











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 #3, 2017: Summary Statistics

	Urine Co (µg/L)				
	UE17-11	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
Target (Robust Mean (x*))	6.2	1.5	2.8	0.91	2.4
Upper Limit	7.7	3	4.3	2.41	3.9
Lower Limit	4.7	0	1.3	0	0.9
Robust SD (s*)	0.4	0.2	0.2	0.11	0.1
Robust RSD (%)	6.5	13.3	7.1	12.1	4.2
Number of Sample Measurements (N)	15	15	15	14	15
Standard Uncertainty (*u*)	0.126	0.051	0.057	0.036	0.045

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 #3, 2017:
Performance of Participating Laboratories

		Urine Co (µg/L)				
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
	Target	**6.2**	**1.5**	**2.8**	**0.91**	**2.4**
103	DRC/CC-ICP-MS	6.39	1.42	2.84	0.869	2.42
107	ICP-MS	6.7	1.8	2.9	1	2.5
110	ICP-MS	6.75	1.82	2.95	1.19	2.76
147	ICP-MS	6.07	1.40	2.67	0.831	2.40
324	ICP-MS	6.18	1.51	2.74	<1	2.40
391	DRC/CC-ICP-MS	5.15	1.19	2.3	0.76	1.90
399	DRC/CC-ICP-MS	6.28	1.45	2.74	0.843	2.34
401	DRC/CC-ICP-MS	6.79	1.42	2.86	0.91	2.47
485	HR-ICP-MS	6.14	1.38	2.81	0.880	2.45
597	DRC/CC-ICP-MS	5.51	1.60	2.54	0.79	1.93
598	ICP-MS	5.98	1.70	3.06	1.01	2.62
599	DRC/CC-ICP-MS	4.91	1.17	2.2	2.18	2.14
605	ICP-MS	6.00	1.36	2.69	0.834	2.34
606	DRC/CC-ICP-MS	6.25	1.45	2.81	0.875	2.47
632	ICP-MS	6.81	1.73	2.95	1.04	2.61

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

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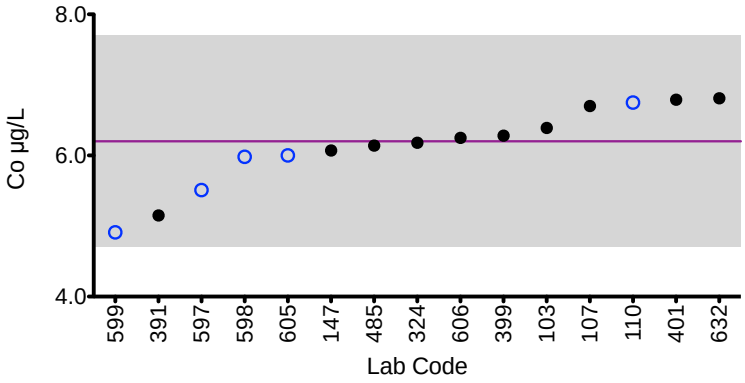
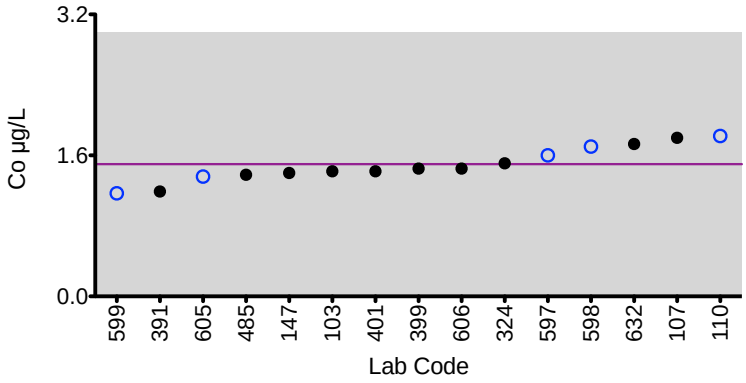
Results for Event #3, 2017: Summary Figures

Urine Co

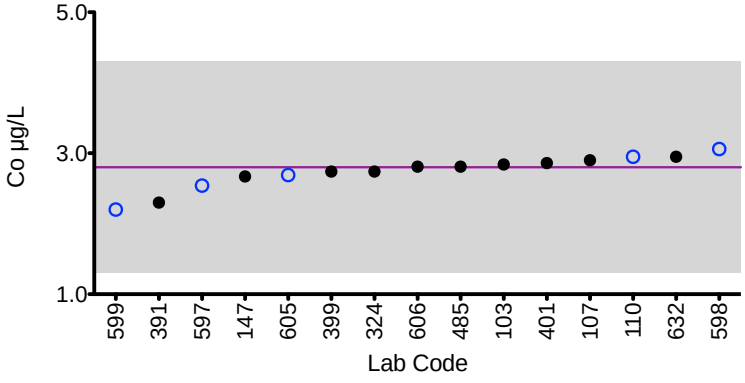
UE17-11



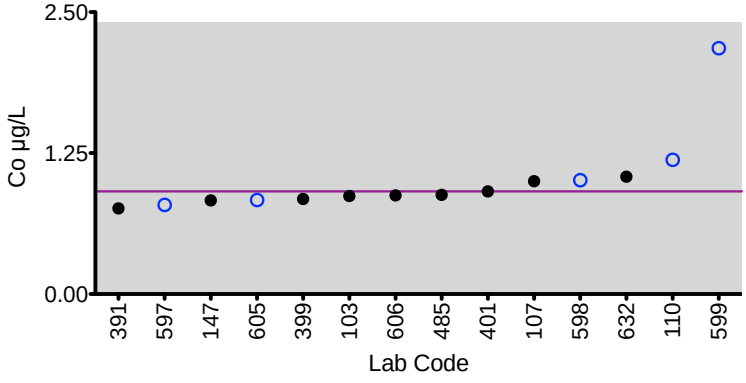
UE17-12



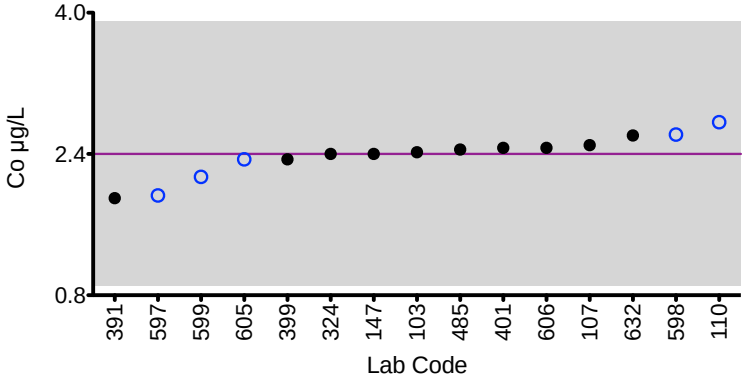
UE17-13



UE17-14



UE17-15



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 #3, 2017: Summary Statistics

	Urine Cr (µg/L)				
	UE17-11	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
Target (Robust Mean (x*))	17	4.8	0.53	2.3	9.1
Upper Limit	20.4	7.8	3.53	5.3	12.1
Lower Limit	13.6	1.8	0	0	6.1
Robust SD (s*)	1.2	0.5	0.09	0.2	0.6
Robust RSD (%)	7.1	10.4	17.0	8.7	6.6
Number of Sample Measurements (N)	12	12	10	12	12
Standard Uncertainty (*u*)	0.438	0.166	0.036	0.057	0.203

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 #3, 2017:
Performance of Participating Laboratories

		Urine Cr (µg/L)				
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
	Target	**17**	**4.8**	**0.53**	**2.3**	**9.1**
103	DRC/CC-ICP-MS	17.3	4.69	0.381	2.18	9.14
107	DRC/CC-ICP-MS	18	5.1	0.57	2.4	9.6
110	DRC/CC-ICP-MS	17.3	5.3	<0.8	2.9	9.5
116	DRC/CC-ICP-MS	17.2	4.48	0.578	2.03	9.10
147	DRC/CC-ICP-MS	16.7	4.47	0.422	2.23	8.58
324	ICP-MS	15.52	3.76	<1	2.34	8.26
391	DRC/CC-ICP-MS	14.45	4.33	0.96	2.26	7.80
401	DRC/CC-ICP-MS	18.3	4.800	0.50	2.36	9.37
485	HR-ICP-MS	17.3	4.82	0.475	2.33	9.43
597	DRC/CC-ICP-MS	15.9	5.66	1.08	2.60	7.99
598	DRC/CC-ICP-MS	16.39	4.70	0.51	2.22	9.26
632	DRC/CC-ICP-MS	19.0	5.11	0.545	2.43	9.76

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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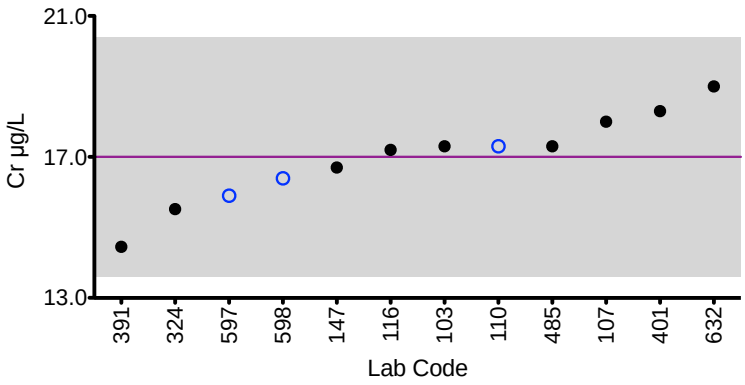
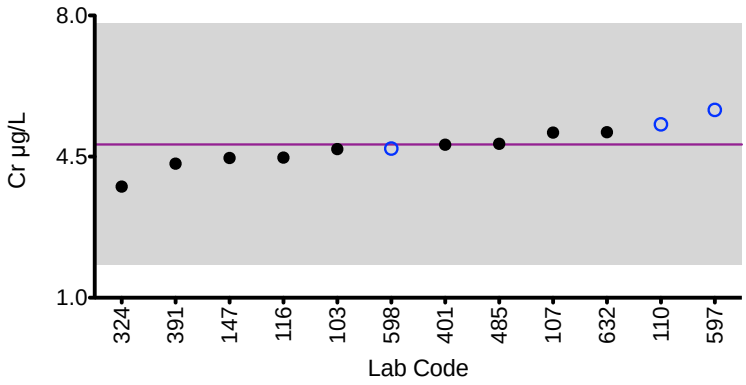
Results for Event #3, 2017: Summary Figures

Urine Cr

UE17-11



UE17-12



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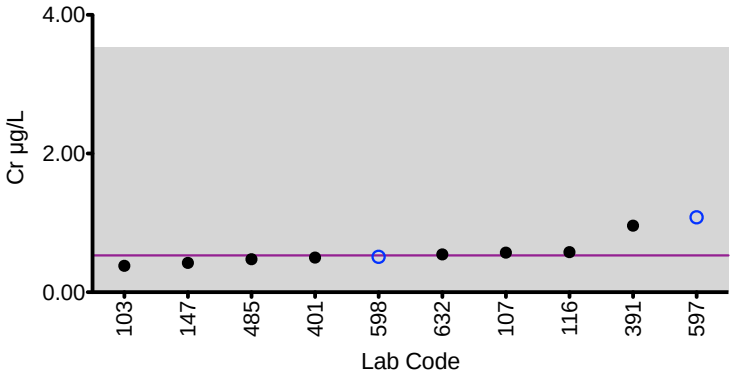
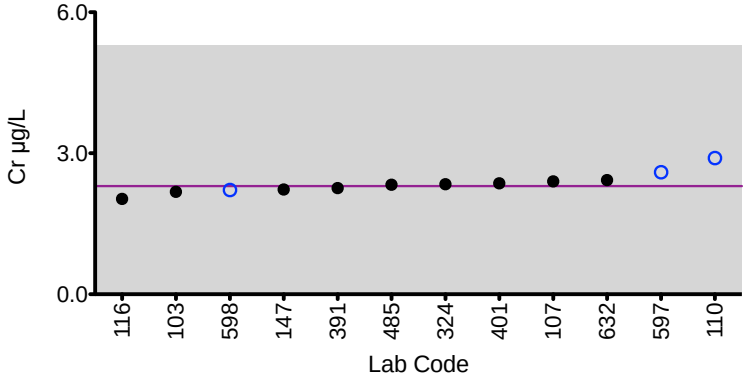
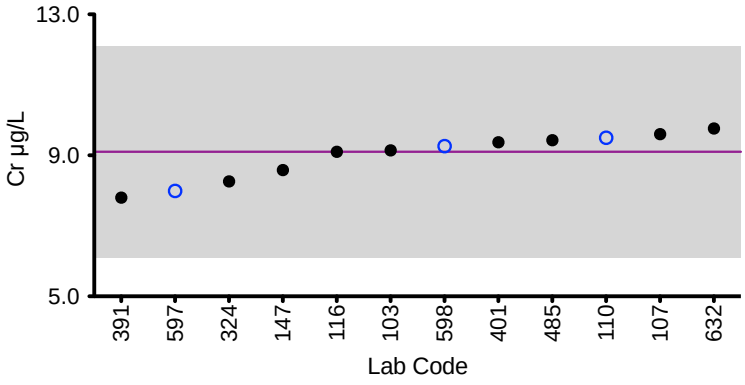


UE17-14



UE17-15



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 #3, 2017: Summary Statistics

	Urine Hg (µg/L)				
	UE17-11	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
Target (Robust Mean (x*))	34.3	6.1	12.8	3.3	24.1
Upper Limit	45	9.1	16.6	6.3	31.3
Lower Limit	24	3.1	9	0.3	16.9
Robust SD (s*)	4.3	0.6	1.2	0.4	1.6
Robust RSD (%)	12.5	9.8	9.4	12.1	6.6
Number of Sample Measurements (N)	15	15	15	15	15
Standard Uncertainty (*u*)	1.380	0.189	0.373	0.134	0.522

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 #3, 2017:
Performance of Participating Laboratories

		Urine Hg (µg/L)				
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
	Target	**34.3**	**6.1**	**12.8**	**3.3**	**24.1**
103	DRC/CC-ICP-MS	37.3	6.54	13.9	3.47	26.2
107	DRC/CC-ICP-MS	35	5.7	13	3.4	25
110	ICP-MS	35.5	5.94	13.0	3.19	24.4
147	CV-AAS	35.2	6.03	13.4	3.13	25.0
200	ICP-MS	40.9	6.7	14.8	3.9	29.2
293	ICP-MS	31.44	6.43	12.6	3.23	23.55
391	DRC/CC-ICP-MS	30.94	12.77 ↑	11.6	3.74	21.45
401	DRC/CC-ICP-MS	44.5	8.18	16.1	3.73	31.5 ↑
598	ICP-MS	29.9	5.79	12.4	2.60	21.46
599	DRC/CC-ICP-MS	21.3 ↓	3.48	9.5	3.83	16.6 ↓
604	DRC/CC-ICP-MS	31.9	5.46	11.5	2.87	22.9
605	ICP-MS	34.9	6.09	12.5	3.31	24.5
606	DRC/CC-ICP-MS	37.5	6.56	13.8	3.04	24.1
632	ICP-MS	30.7	5.99	12.1	2.32	23.2
684	DRC/CC-ICP-MS	34.60	5.74	12.6	3.23	24.10

Based on the grading criteria for Hg in Urine, 95% of results were satisfactory, with 1 of the 15 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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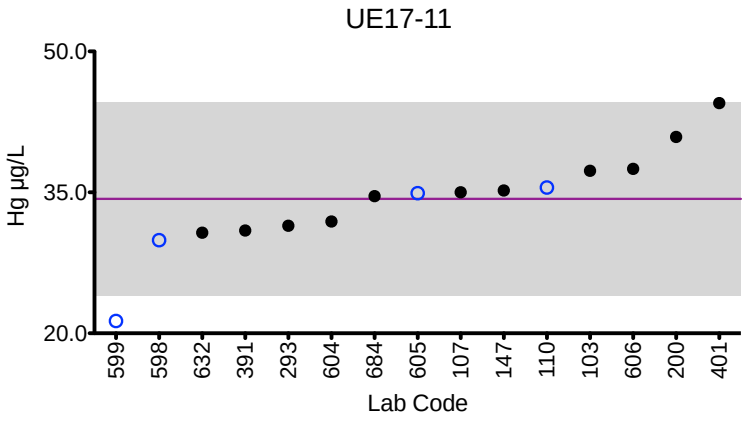
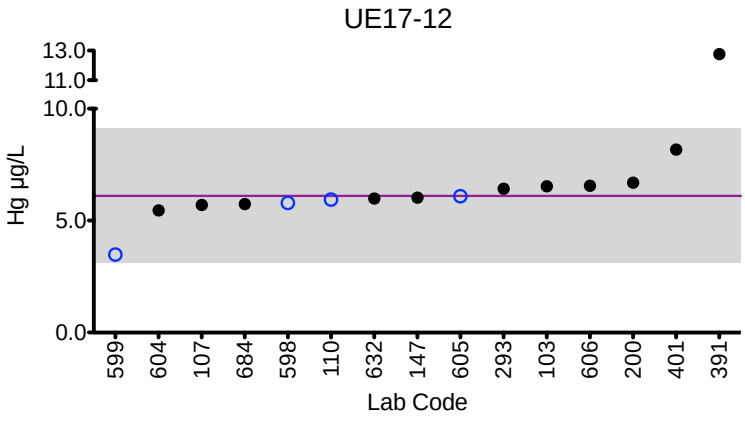
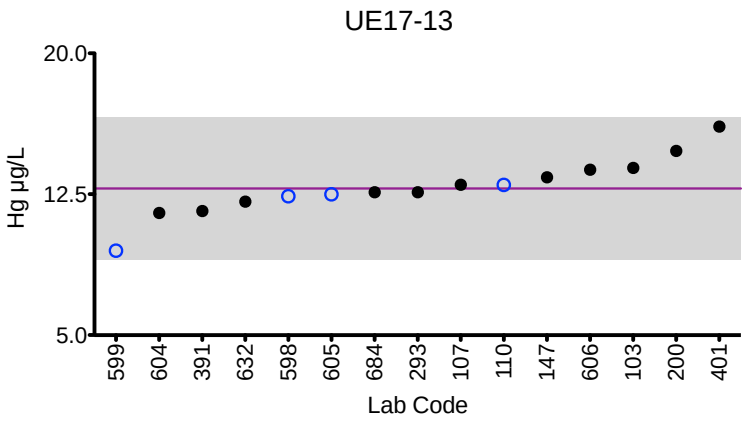
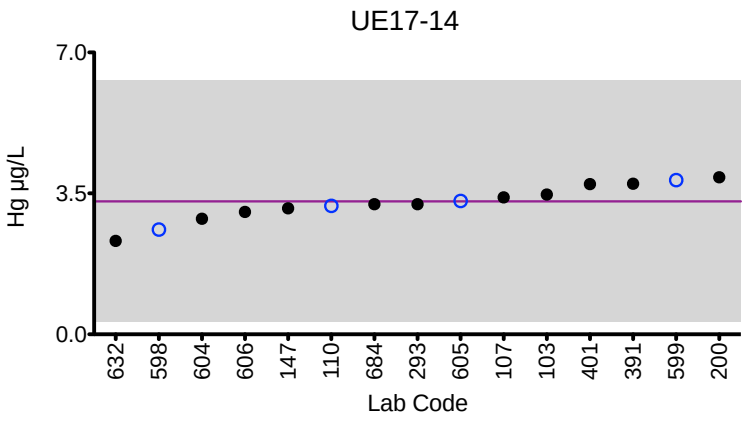
Results for Event #3, 2017: Summary Figures

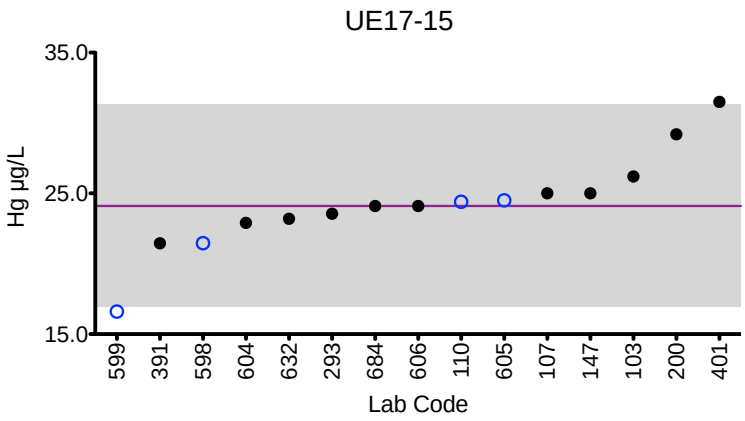
Urine Hg











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 #3, 2017: Summary Statistics

	Urine Mn (µg/L)				
	UE17-11	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
Target (Robust Mean (x*))	2.8	7.9	1.4	1.1	2.1
Upper Limit	3.5	9.9	1.95	1.65	2.65
Lower Limit	2.1	5.9	0.85	0.55	1.55
Robust SD (s*)	0.2	0.8	0.2	0.2	0.3
Robust RSD (%)	7.1	10.1	14.3	18.2	14.3
Number of Sample Measurements (N)	16	16	16	16	16
Standard Uncertainty (*u*)	0.075	0.257	0.065	0.067	0.095

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 #3, 2017:
Performance of Participating Laboratories

		Urine Mn (µg/L)				
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
	Target	**2.8**	**7.9**	**1.4**	**1.1**	**2.1**
103	DRC/CC-ICP-MS	2.76	7.86	1.36	1.00	2.13
107	DRC/CC-ICP-MS	2.9	8.4	1.5	1.3	2.3
110	ICP-MS	2.65	7.63	1.31	0.94	2.05
116	DRC/CC-ICP-MS	2.74	7.42	1.35	0.964	1.94
147	DRC/CC-ICP-MS	2.57	7.64	1.21	0.962	1.93
324	ICP-MS	2.83	7.85	1.40	1.09	2.14
391	DRC/CC-ICP-MS	2.55	6.62	1.13	1.07	1.75
399	DRC/CC-ICP-MS	2.66	7.68	1.28	0.996	2.02
597	DRC/CC-ICP-MS	2.75	8.78	1.69	1.31	2.12
598	ICP-MS	2.99	8.35	2.17 ↑	1.61	2.81 ↑
599	DRC/CC-ICP-MS	2.10	6.36	1.24	2.88 ↑	1.55
605	ICP-MS	2.58	7.10	1.18	0.816	1.87
606	DRC/CC-ICP-MS	2.72	8.00	1.39	0.994	2.16
630	ICP-MS	3.49	9.43	2.67 ↑	2.25 ↑	3.39 ↑
632	DRC/CC-ICP-MS	3.20	8.62	1.50	1.09	2.34
684	ICP-MS	3.22	8.86	1.89	1.44	2.63

Based on the grading criteria for Mn in Urine, 93% of results were satisfactory, with 2 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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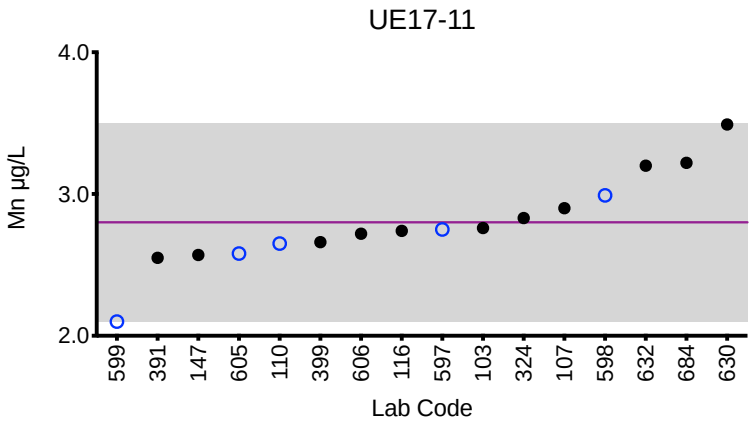
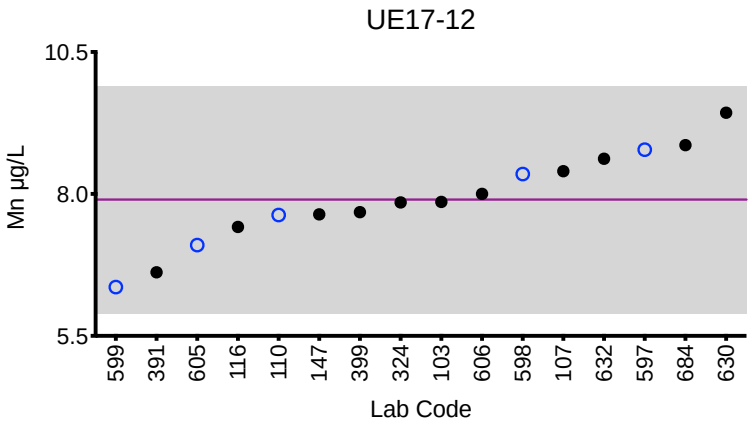
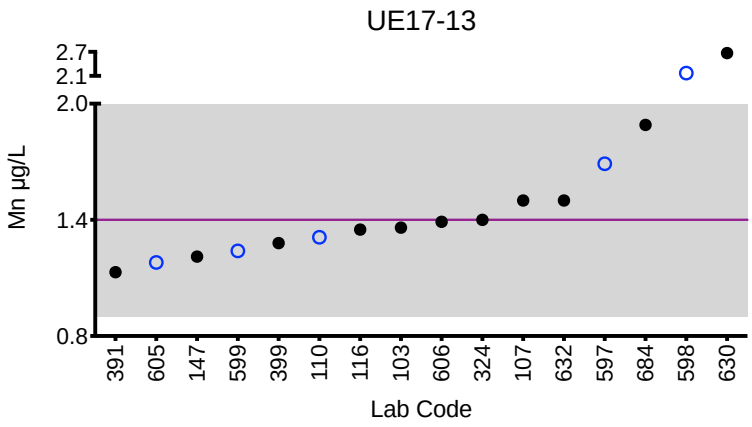
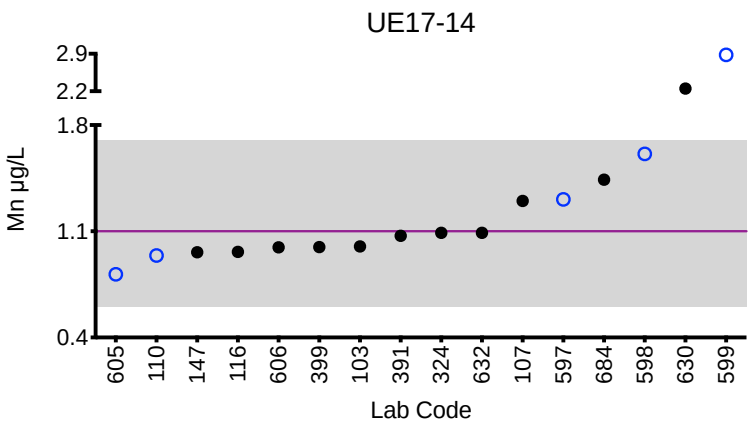
Results for Event #3, 2017: Summary Figures

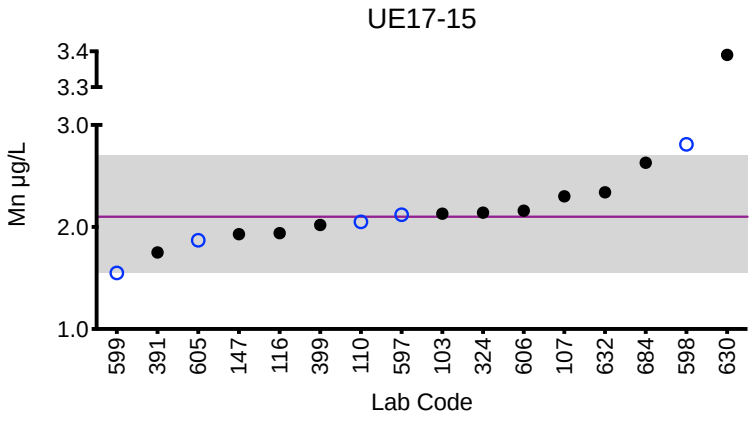
Urine Mn











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 #3, 2017: Summary Statistics

	Urine Pb (µg/L)				
	UE17-11	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
Target (Robust Mean (x*))	7	12.4	2.4	1.4	5.1
Upper Limit	8.4	14.9	3.4	2.4	6.12
Lower Limit	5.6	9.9	1.4	0.4	4.08
Robust SD (s*)	0.5	1.0	0.1	0.1	0.3
Robust RSD (%)	7.1	8.1	4.2	7.1	5.9
Number of Sample Measurements (N)	18	18	18	17	18
Standard Uncertainty (*u*)	0.146	0.291	0.044	0.029	0.089

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 #3, 2017:
Performance of Participating Laboratories

		Urine Pb (µg/L)				
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
	Target	**7**	**12.4**	**2.4**	**1.4**	**5.1**
103	DRC/CC-ICP-MS	7.36	13.2	2.53	1.41	5.39
107	ICP-MS	7.5	13	2.5	1.4	5.3
110	ICP-MS	7.2	12.5	2.5	1.3	5.2
116	ICP-MS	6.85	12.2	2.41	1.33	5.12
147	ICP-MS	6.76	12.2	2.32	*11.9 ↑	5.10
200	ICP-MS	7.7	13.7	2.9	1.2	5.6
293	ICP-MS	7.4	13.5	2.3	1.5	4.9
324	ICP-MS	6.57	9.90 ↓	2.27	1.26	4.73
391	DRC/CC-ICP-MS	6.4	11.3	2.3	1.3	4.9
399	ICP-MS	7.15	12.5	2.46	1.34	5.23
597	DRC/CC-ICP-MS	6.88	14.7	2.71	1.51	4.61
598	ICP-MS	6.18	11.1	2.22	1.23	4.34
599	DRC/CC-ICP-MS	5.65	10.6	2.04	2.16	4.72
605	ICP-MS	6.7	12.2	2.36	1.34	5.04
606	ICP-MS	6.75	12.0	2.34	1.33	4.99
607	ICP-MS	7.50	13.3	2.53	1.48	5.39
632	ICP-MS	7.15	12.5	2.39	1.34	5.16
686	ICP-MS	7.21	12.6	2.48	1.39	5.29

Based on the grading criteria for Pb in Urine, 98% of results were satisfactory, with 0 of the 18 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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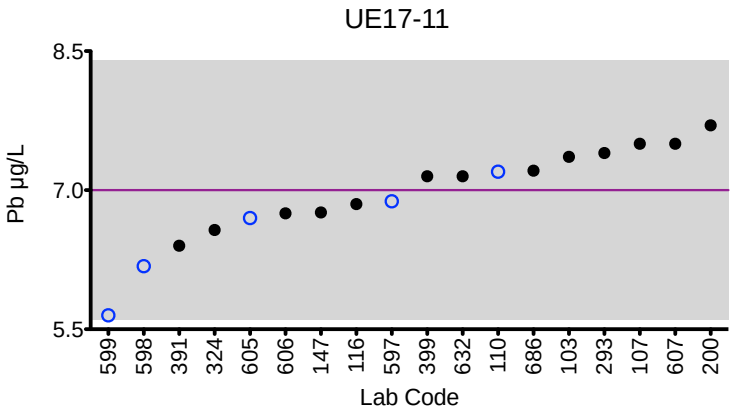
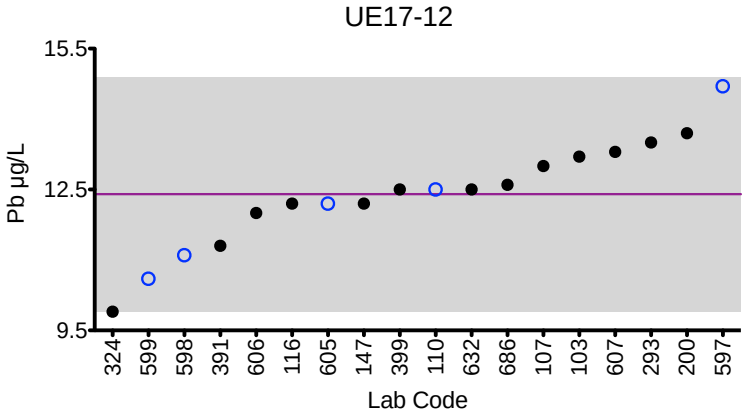
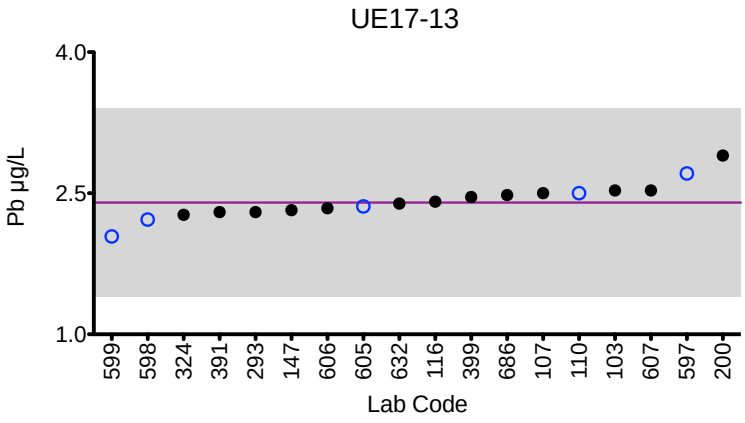
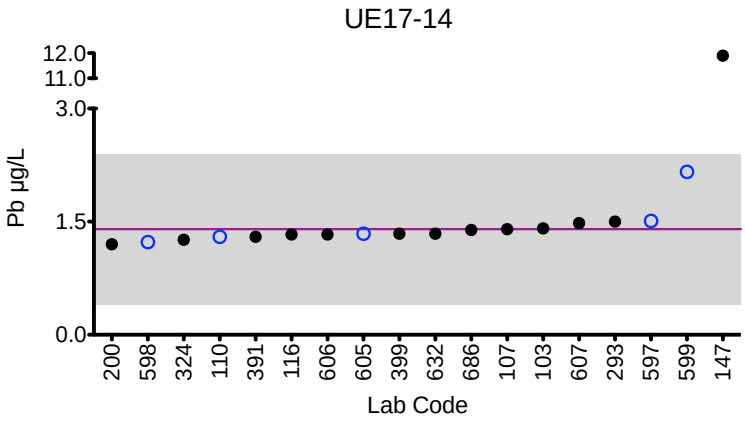
Results for Event #3, 2017: Summary Figures

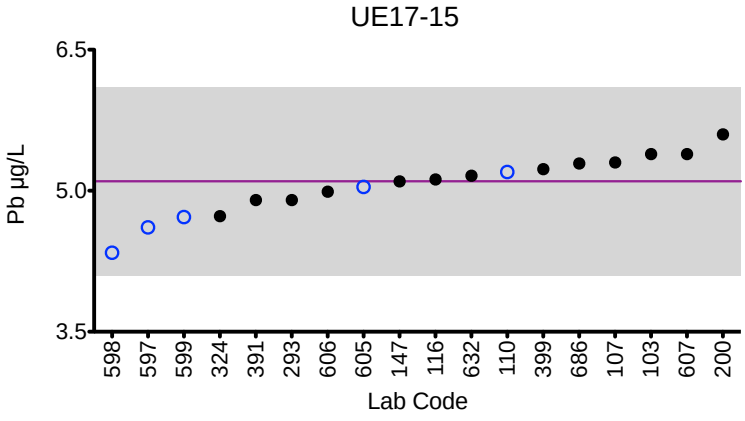
Urine Pb











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 #3, 2017: Summary Statistics

Urine Tl (µg/L)					
	UE17-11	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
Target (Robust Mean (x*))	1.08	1.85	5.3	0.31	0.75
Upper Limit	1.3	2.22	6.36	0.51	0.95
Lower Limit	0.86	1.48	4.24	0.11	0.55
Robust SD (s*)	0.03	0.05	0.17	0.005	0.02
Robust RSD (%)	2.8	2.7	3.2	1.5	2.7
Number of Sample Measurements (N)	14	14	14	14	14
Standard Uncertainty (*u*)	0.0110	0.0170	0.0560	0.0015	0.0053

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 #3, 2017:
Performance of Participating Laboratories

		Urine Tl (µg/L)				
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
	Target	**1.08**	**1.85**	**5.3**	**0.31**	**0.75**
103	DRC/CC-ICP-MS	1.12	1.92	5.46	0.307	0.755
107	ICP-MS	1.1	1.9	5.5	0.31	0.74
110	ICP-MS	1.09	1.86	5.34	0.31	0.72
116	ICP-MS	1.08	1.82	5.26	0.300	0.731
147	ICP-MS	1.08	1.83	5.36	0.307	0.767
293	ICP-MS	1.10	1.84	5.28	0.31	0.76
399	ICP-MS	1.07	1.84	5.39	0.308	0.759
597	DRC/CC-ICP-MS	0.958	2.01	4.73	0.274	0.605
598	ICP-MS	0.94	1.68	4.90	0.27	0.62
605	ICP-MS	1.05	1.85	5.33	0.307	0.752
606	ICP-MS	1.01	1.76	4.93	0.291	0.699
607	ICP-MS	1.12	1.88	5.49	0.332	0.754
632	ICP-MS	1.09	1.84	5.11	0.324	0.76
686	ICP-MS	1.11	1.92	5.42	0.309	0.760

Based on the grading criteria for Tl in Urine, 100% 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

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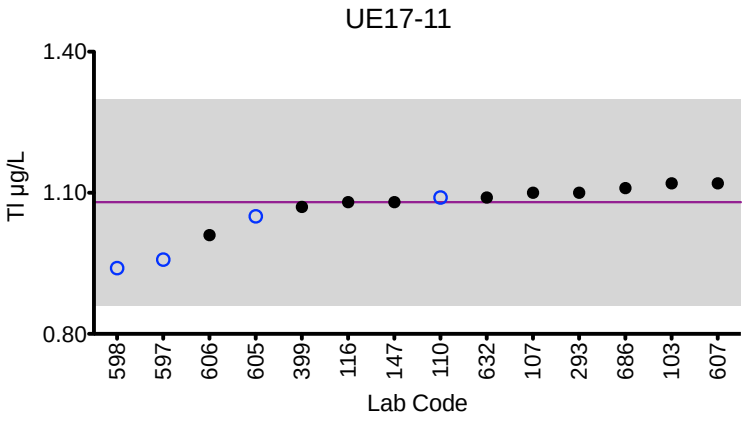
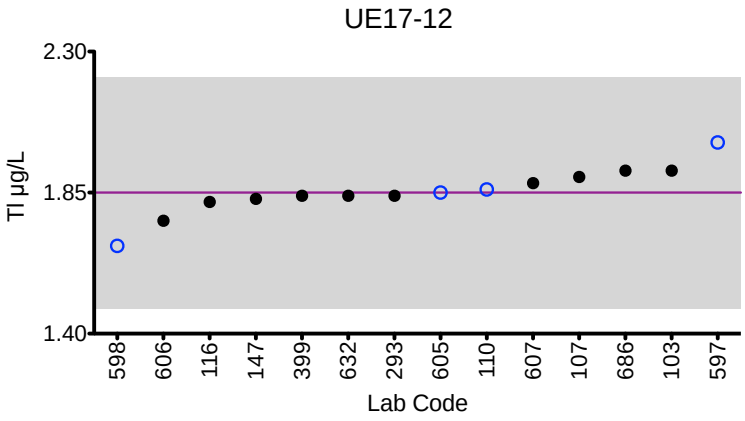
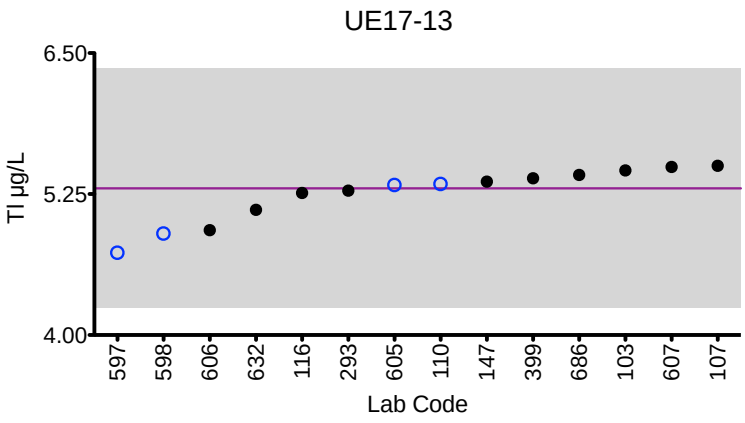
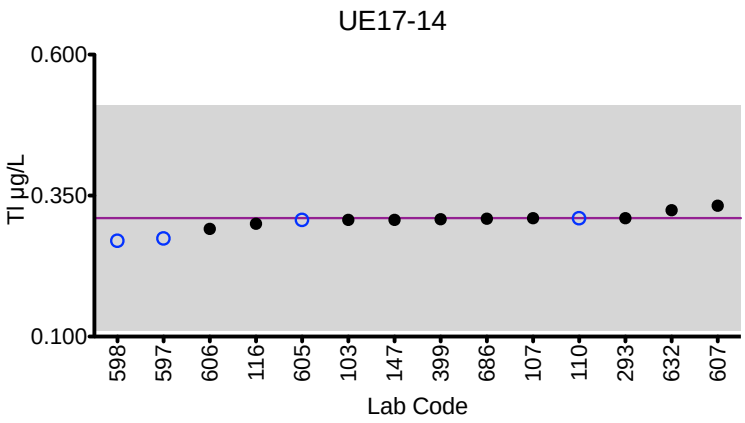
Results for Event #3, 2017: Summary Figures

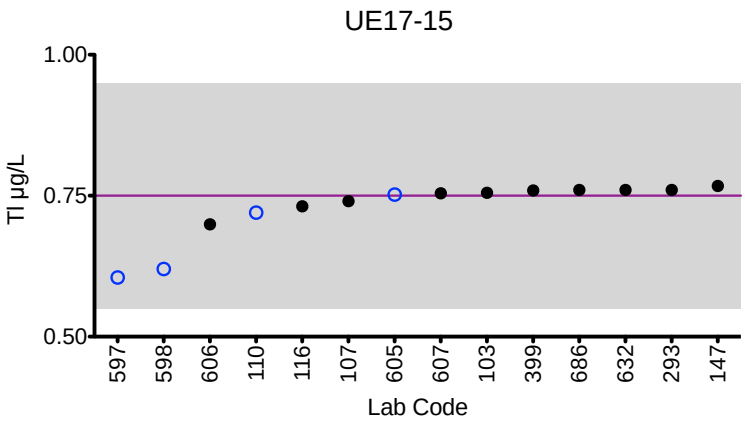
Urine Tl











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 #3, 2017: Summary Statistics

	Urine U (µg/L)				
	UE17-11	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
Target (Robust Mean (x*))	0.057	0.011	0.19	0.027	0.063
Upper Limit	0.087	0.041	0.228	0.057	0.093
Lower Limit	0.027	0	0.152	0	0.033
Robust SD (s*)	0.003	0.002	0.009	0.003	0.003
Robust RSD (%)	5.3	18.2	4.7	11.1	4.8
Number of Sample Measurements (N)	16	12	16	16	16
Standard Uncertainty (*u*)	0.00110	0.00068	0.00270	0.00083	0.00100

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 #3, 2017:
Performance of Participating Laboratories

		Urine U (µg/L)				
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
	Target	**0.057**	**0.011**	**0.19**	**0.027**	**0.063**
103	DRC/CC-ICP-MS	0.0533	0.00784	0.185	0.0256	0.0620
107	ICP-MS	0.058	0.013	0.2	0.028	0.066
110	ICP-MS	0.058	0.012	0.193	0.028	0.061
116	ICP-MS	0.0526	<0.0108	0.197	0.0248	0.0607
147	ICP-MS	0.0455	< 0.0105	0.167	0.0112	0.0502
324	ICP-MS	0.054	0.011	0.175	0.026	0.060
399	ICP-MS	0.055	0.01	0.175	0.023	0.062
598	ICP-MS	0.076	0.026	0.188	0.035	0.068
604	ICP-MS	0.056	0.012	0.182	0.026	0.060
605	ICP-MS	0.061	0.012	0.200	0.028	0.067
606	ICP-MS	0.057	0.010	0.186	0.025	0.063
607	ICP-MS	0.054	0.010	0.198	0.029	0.064
630	ICP-MS	0.056	0.010	0.191	0.026	0.064
632	ICP-MS	0.0594	<0.015	0.194	0.0309	0.0673
684	ICP-MS	0.058	0.013	0.196	0.030	0.064
686	ICP-MS	0.0594	<0.015	0.193	0.0265	0.0646

Based on the grading criteria for U in Urine, 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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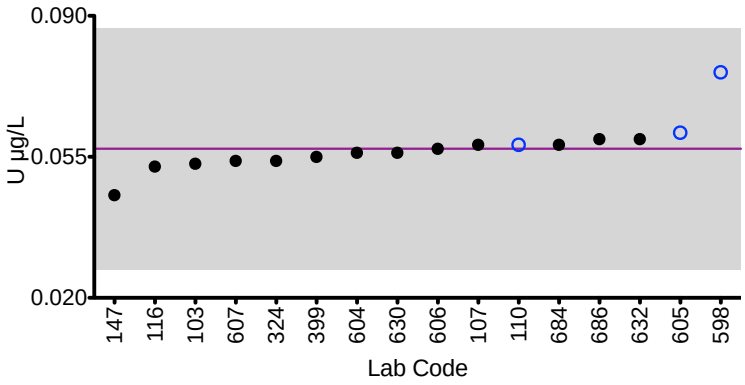
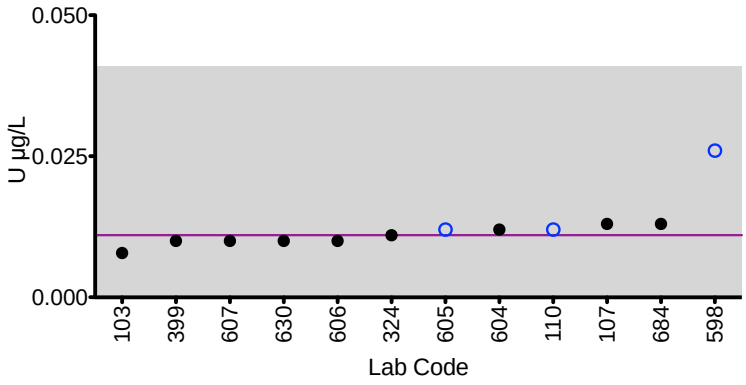
Results for Event #3, 2017: Summary Figures

Urine U

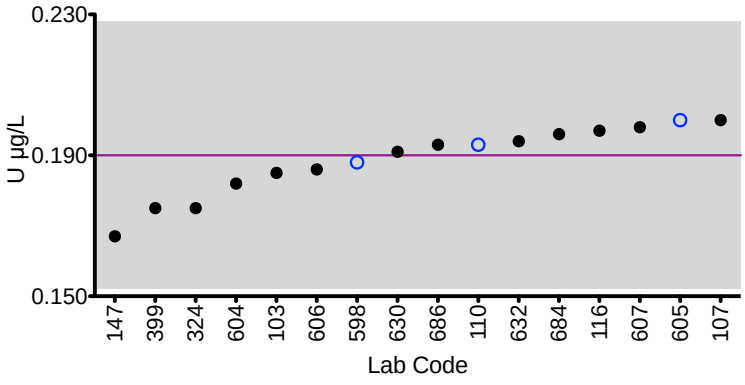
UE17-11



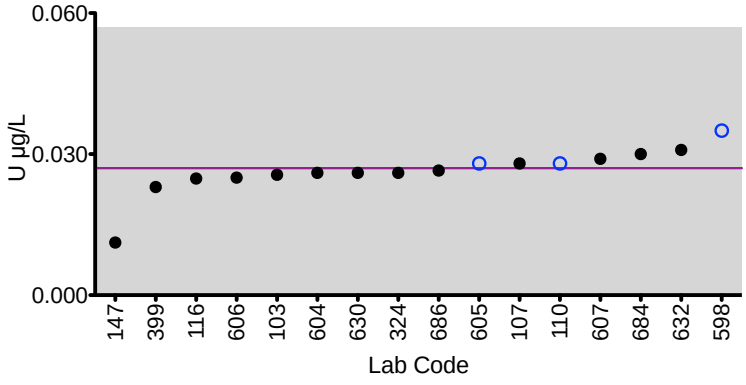
UE17-12



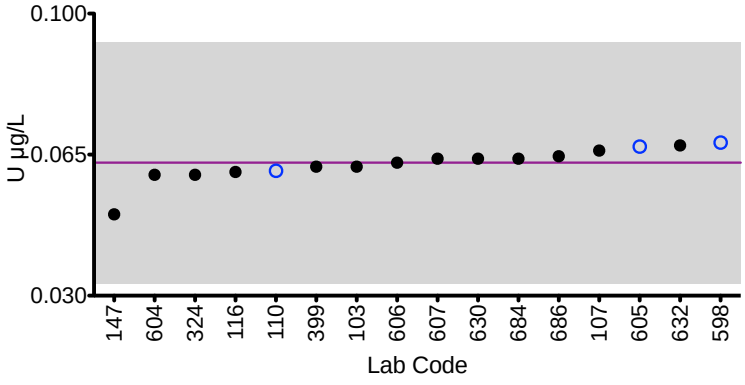
UE17-13



UE17-14



UE17-15



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 #3, 2017:
Laboratory Data and Summary Statistics

Urine Cs (µg/L)

Lab Code	Method	UE17-11	UE17-12	UE17-13	UE17-14	UE17-15
107	ICP-MS	5.6	10	2.6	7.6	15
110	ICP-MS	5.7	10.6	2.7	7.4	15.1
147	ICP-MS	5.41	10.0	2.83	7.19	14.5
399	ICP-MS	5.56	10.30	2.68	7.52	15.30
597	DRC/CC-ICP-MS	4.77	10.9	2.35	6.58	12.1
598	ICP-MS	5.32	10.6	2.77	7.52	15.7
599	DRC/CC-ICP-MS	4.98	9.78	2.35	8.52	14.9
605	ICP-MS	5.27	10.0	2.52	7.18	14.6
606	DRC/CC-ICP-MS	5.63	10.4	2.71	7.51	15.4
632	ICP-MS	5.95	10.7	2.69	7.83	15.5

Summary Statistics

	UE17-11	UE17-12	UE17-13	UE17-14	UE17-15
Robust Mean (x*)	5.5	10.3	2.6	7.5	15
Robust SD (s*)	0.3	0.4	0.1	0.3	0.5
Robust RSD (%)	5.5	3.9	3.8	4	3.3
Number of Sample Measurements (N)	10	10	10	10	10
Standard Uncertainty (*u*)	0.124	0.167	0.052	0.13	0.213

*Denotes a statistical Outlier.

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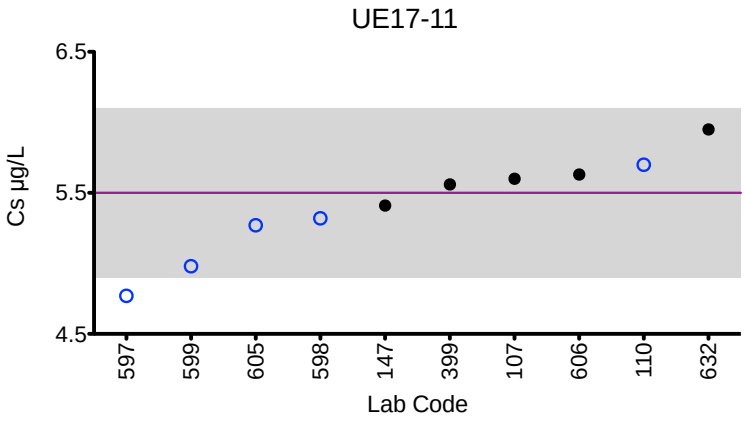
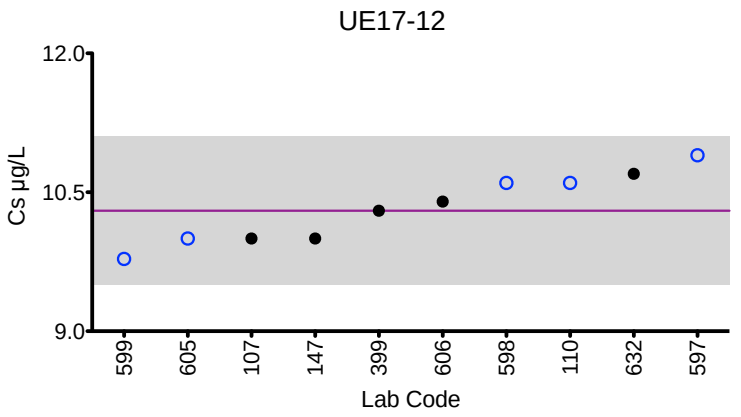
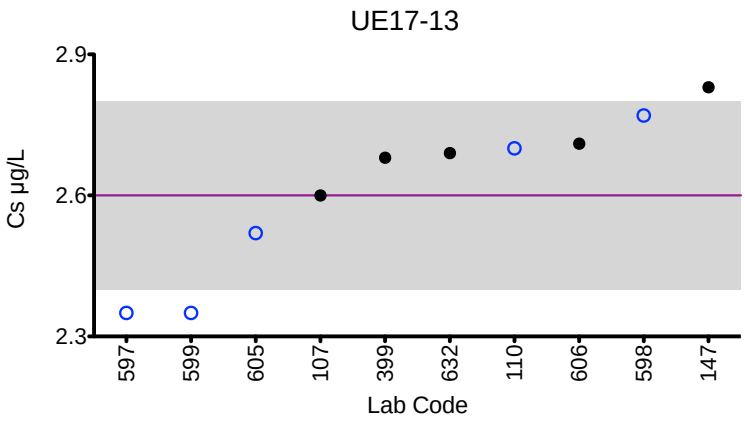
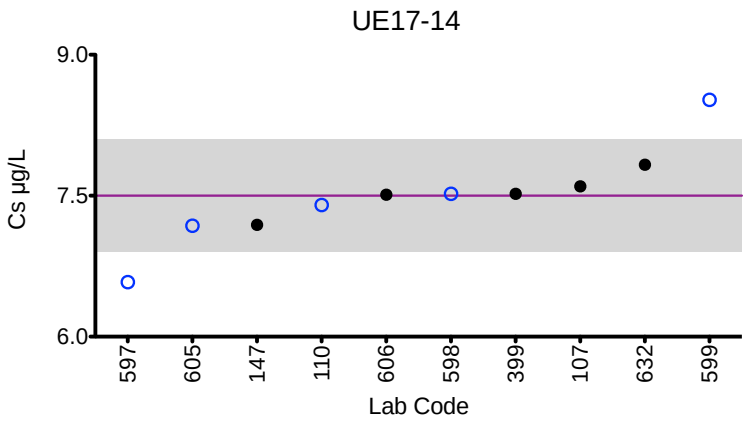
Results for Event #3, 2017: Summary Figures

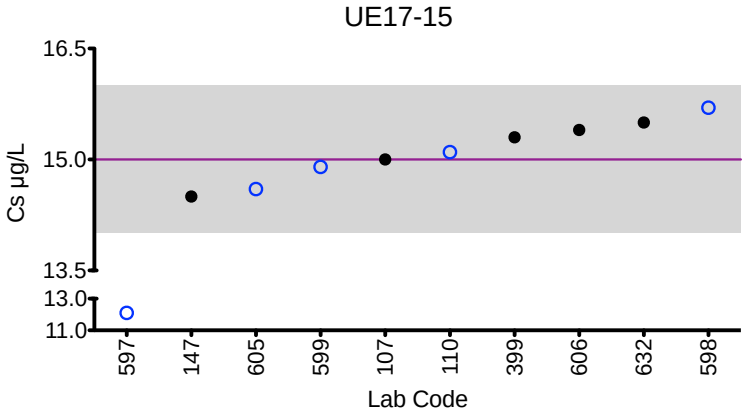
Urine Cs











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 #3, 2017:
Laboratory Data and Summary Statistics

Urine Cu (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
110	ICP-MS	28.7	74.6	42.4	20.4	112
116	DRC/CC-ICP-MS	24.5	68.4	37.1	15.5	98.3
147	ICP-MS	28.3	71.8	41.9	19.6	107
293	ICP-MS	24.8	67	37.5	17.2	103.0
324	ICP-MS	25.81	69.70	39.86	17.72	104.92
391	DRC/CC-ICP-MS	19.5	48	31.0	15.1	74.2
401	DRC/CC-ICP-MS	24.8	67.4	37.5	15.9	101
597	DRC/CC-ICP-MS	24.1	80.1	37.5	17.1	87.9
598	ICP-MS	30.5	69.3	40.69	18.33	105
632	ICP-MS	32.4	88.1	45.9	22.8	116

Summary Statistics					
	UE17-11	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
Robust Mean (x*)	26.2	70.2	39.2	17.8	103
Robust SD (s*)	3.3	4.2	3.1	2.4	8
Robust RSD (%)	12.6	6	7.9	13.5	7.8
Number of Sample Measurements (N)	10	10	10	10	10
Standard Uncertainty (*u*)	1.29	1.66	1.21	0.946	2.97

*Denotes a statistical Outlier.

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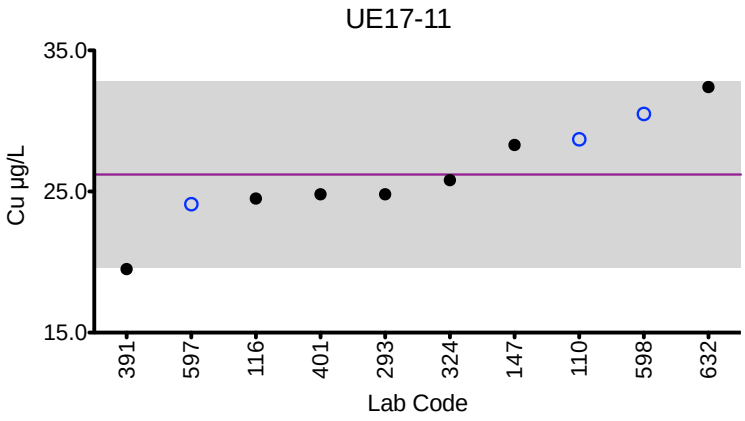
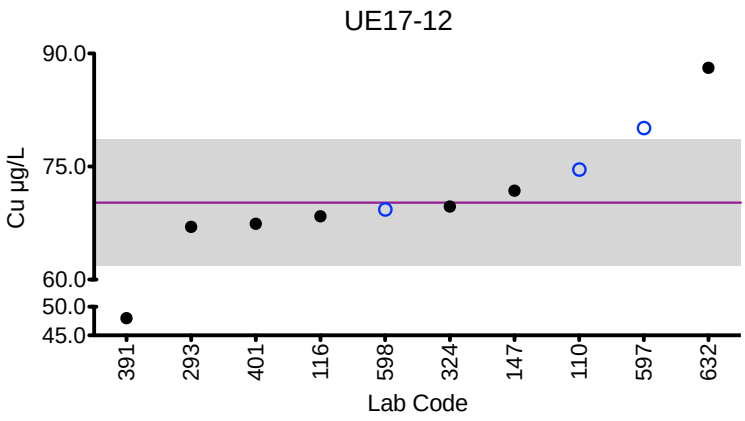
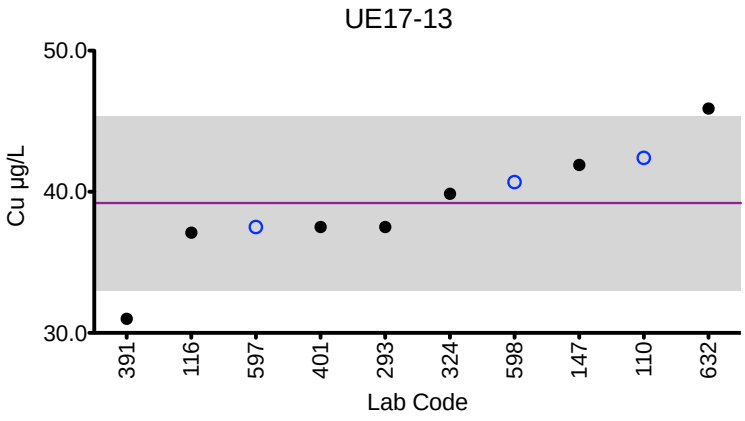
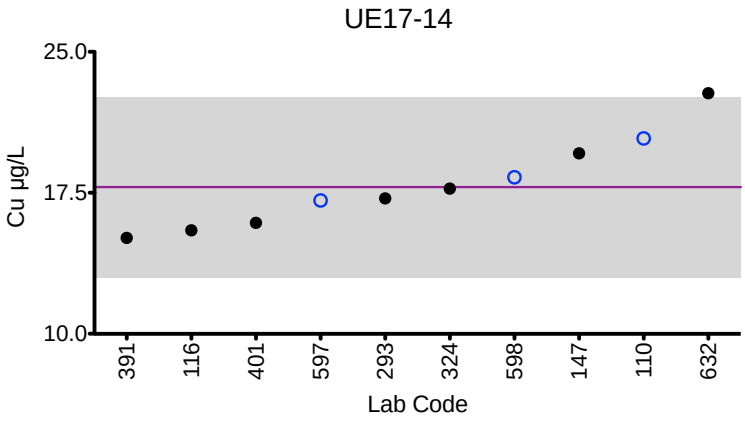
Results for Event #3, 2017: Summary Figures

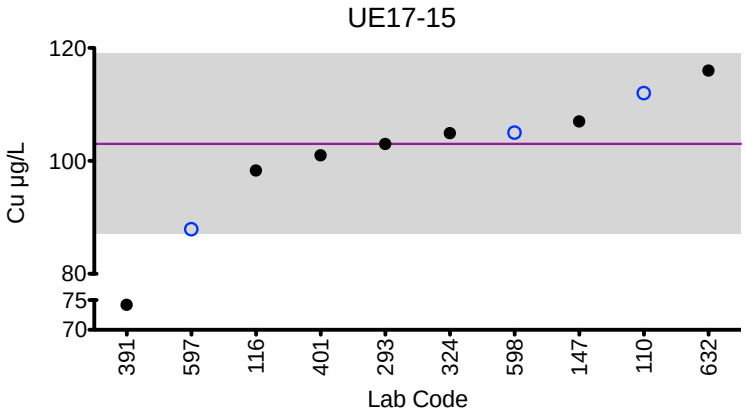
Urine Cu











Legend:
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Gray area = ±2SD of the mean.

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Urine Mo (µg/L)

Lab Code	Method	UE17-11	UE17-12	UE17-13	UE17-14	UE17-15
103	DRC/CC-ICP-MS	51.3	128	122	98.7	288
107	ICP-MS	52	130	120	100	280
110	ICP-MS	51.5	129	128	103	298
147	ICP-MS	49.2	126	122	96.0	280
293	ICP-MS	50.3	125.4	119.9	99.5	279.7
324	ICP-MS	51.01	124.52	120.36	96.98	275.96
399	ICP-MS	50.2	128	121	97.7	289
485	HR-ICP-MS	51.6	128	122	98.3	291
597	DRC/CC-ICP-MS	43.5	140	110	87.2	233
598	DRC/CC-ICP-MS	47.3	128.4	129.6	96.5	289.1
599	DRC/CC-ICP-MS	34.9	96.2	85.5	77.8	234.9
605	ICP-MS	48.4	123	118	93.3	279
606	DRC/CC-ICP-MS	50.2	129	122	97.0	290
632	ICP-MS	56.6	142	134	109	313

Summary Statistics

	UE17-11	UE17-12	UE17-13	UE17-14	UE17-15
Robust Mean (x*)	50.1	128	121	97	284
Robust SD (s*)	2.1	3	3	3	9
Robust RSD (%)	4.2	2.3	2.5	3.1	3.2
Number of Sample Measurements (N)	14	14	14	14	14
Standard Uncertainty (*u*)	0.71	1.09	0.929	1.01	3.15

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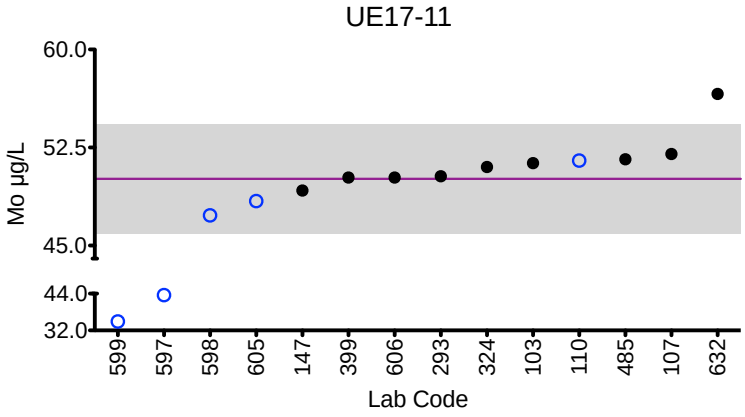
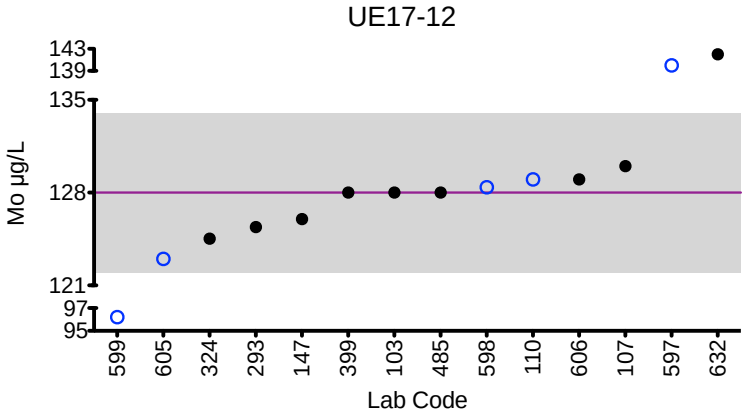
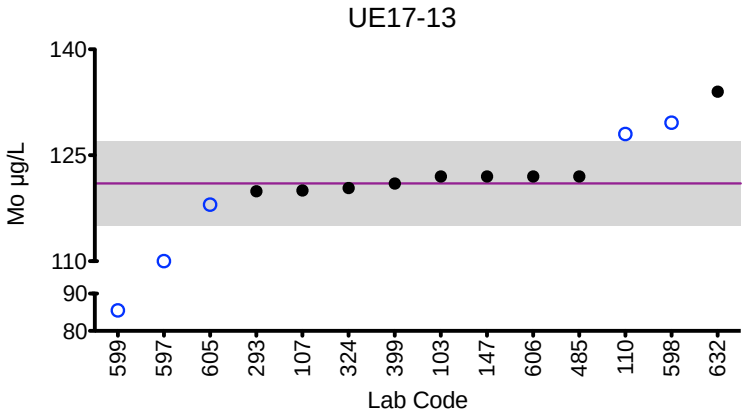
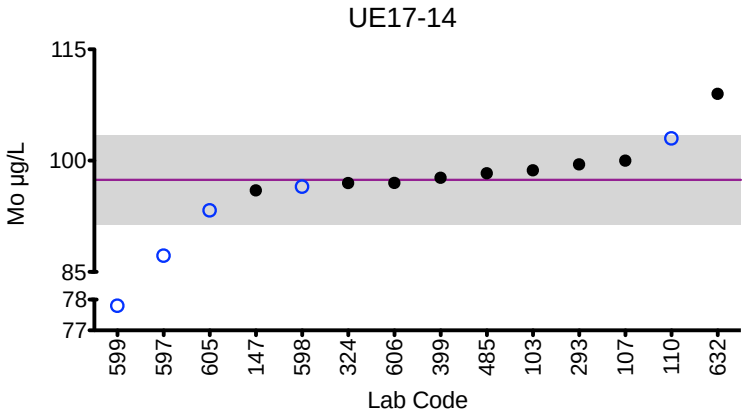
Results for Event #3, 2017: Summary Figures

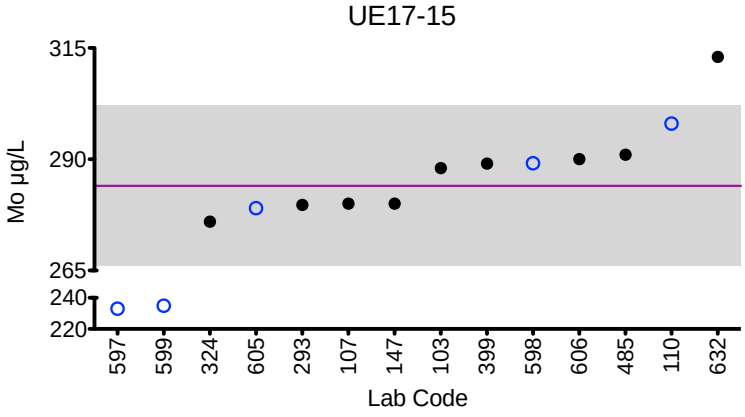
Urine Mo











Legend:
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Gray area = ±2SD of the mean.

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Urine Ni (µg/L)

Lab Code	Method	UE17-11	UE17-12	UE17-13	UE17-14	UE17-15
107	DRC/CC-ICP-MS	4.9	2.4	4.5	8.1	14
110	ICP-MS	5.6	3.2	5.1	9.5	14.3
293	ICP-MS	4.38	1.57	3.58	7.12	11.81
324	ICP-MS	5.12	2.85	4.65	7.75	13.20
391	DRC/CC-ICP-MS	*8.0	5.5	*7.5	9.9	14.7
401	DRC/CC-ICP-MS	5.400	2.88	4.58	7.63	13.8
485	HR-ICP-MS	4.59	1.66	3.98	7.74	13.7
597	DRC/CC-ICP-MS	4.59	3.26	4.98	7.98	12.9
598	ICP-MS	5.70	4.31	5.52	8.70	14.6

Summary Statistics

	UE17-11	UE17-12	UE17-13	UE17-14	UE17-15
Arithmetic Mean ($\bar{x}$)	5	3.1	4.6	8.3	13.7
Arithmetic SD (s)	0.5	1.2	0.6	0.9	0.9
Arithmetic RSD (%)	10	38.7	13	10.8	6.6
Number of Sample Measurements (N)	8	9	8	9	9

*Denotes a statistical Outlier.

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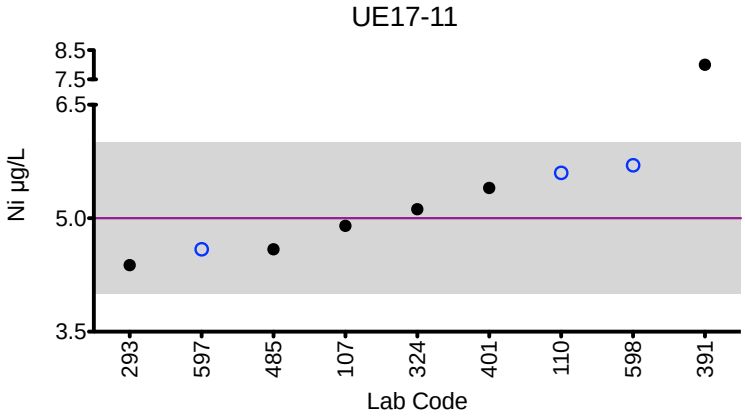
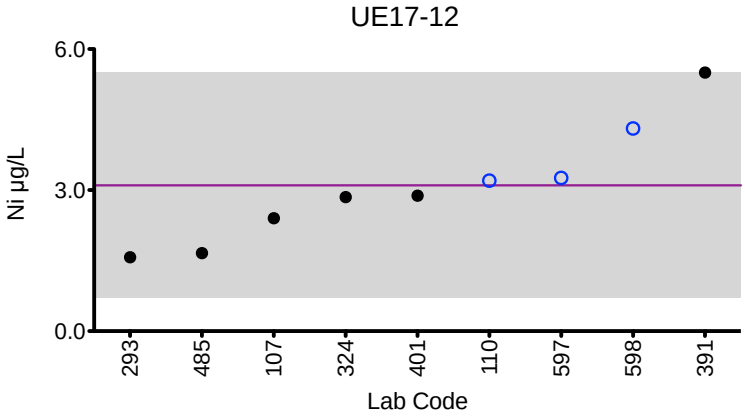
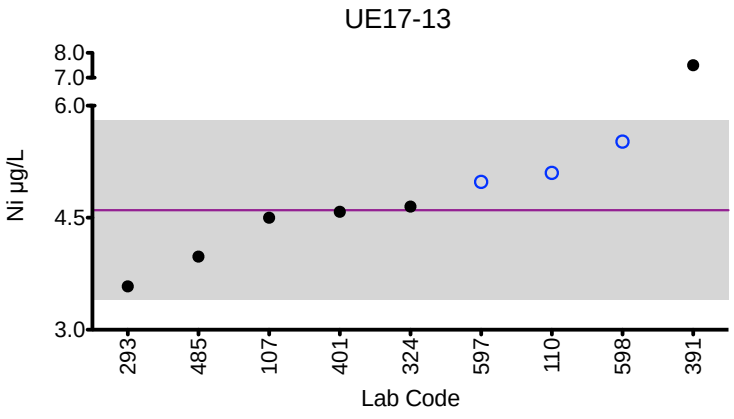
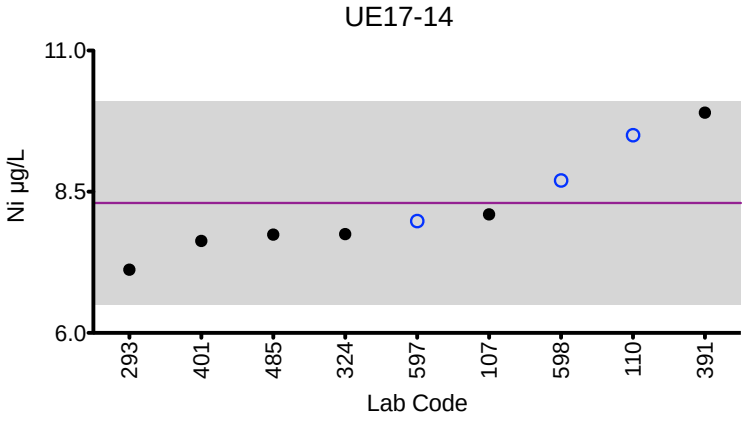
Results for Event #3, 2017: Summary Figures

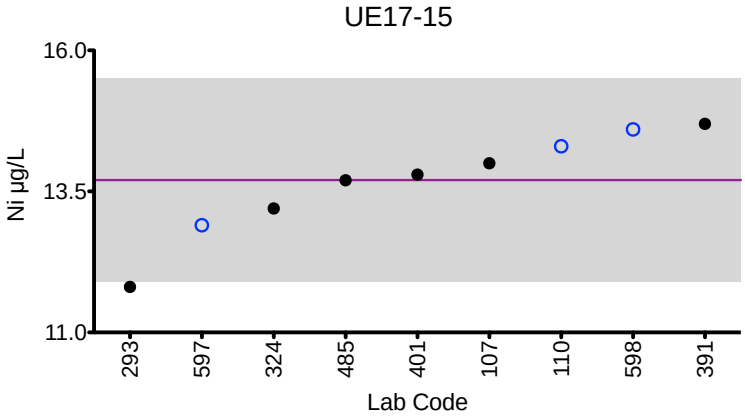
Urine Ni











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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Urine Pt (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
107	ICP-MS	2.2	0.65	5.6	0.3	1.2
110	ICP-MS	2.23	0.60	5.39	0.20	1.22
147	ICP-MS	2.07	0.554	4.94	0.222	1.11
399	ICP-MS	2.16	0.597	5.21	0.234	1.19
598	ICP-MS	2.01	0.63	5.24	0.21	1.12
632	ICP-MS	2.17	0.658	4.89	0.244	1.24
Summary Statistics						
		UE17-11	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
Arithmetic Mean ($\bar{x}$)		2.14	0.61	5.21	0.23	1.18
Arithmetic SD (s)		0.08	0.04	0.27	0.04	0.05
Arithmetic RSD (%)		3.7	6.6	5.2	17.4	4.2
Number of Sample Measurements (N)		6	6	6	6	6

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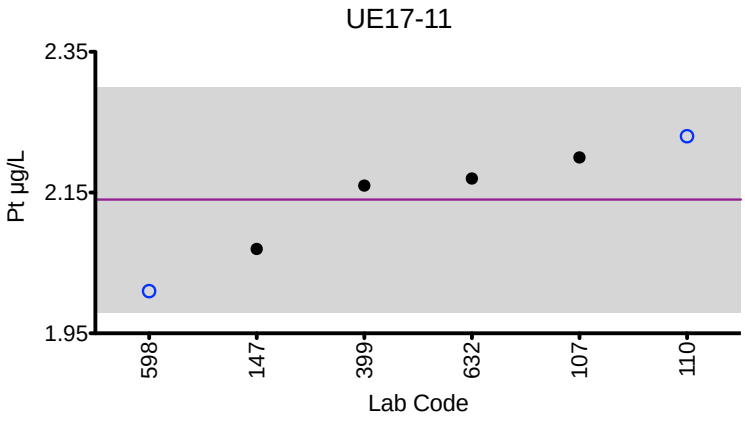
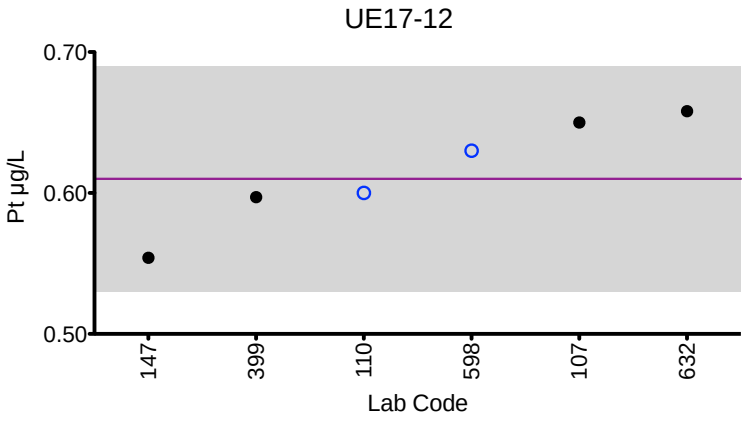
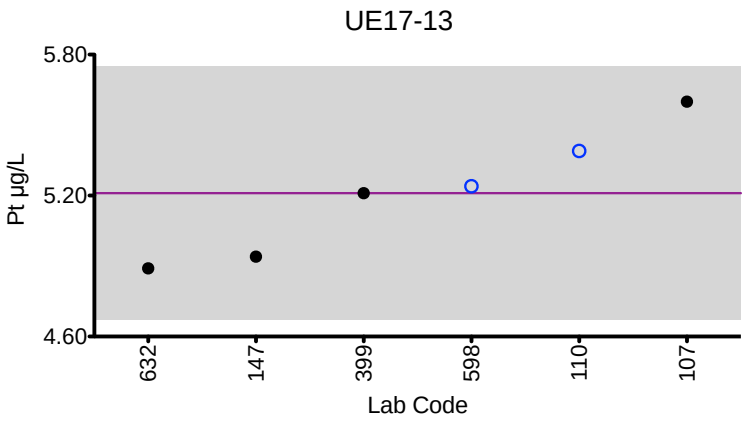
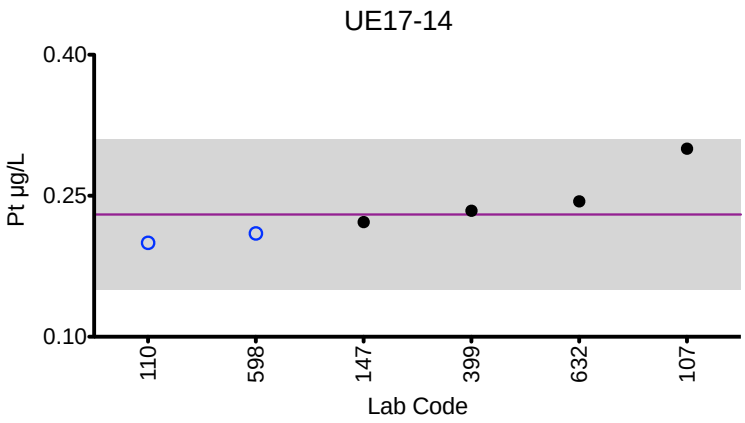
Results for Event #3, 2017: Summary Figures

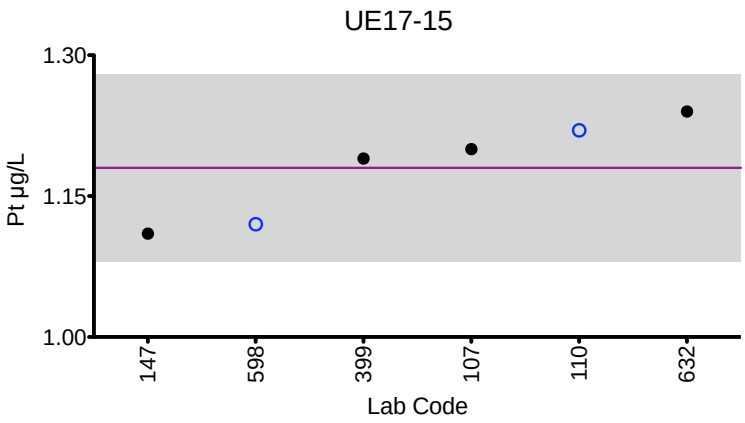
Urine Pt











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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Urine Sb (µg/L)

Lab Code	Method	UE17-11	UE17-12	UE17-13	UE17-14	UE17-15
103	DRC/CC-ICP-MS	0.324	0.825	1.64	0.589	1.27
107	ICP-MS	0.52	0.83	1.6	0.84	1.7
110	ICP-MS	0.3	0.8	1.5	0.6	1.2
147	ICP-MS	0.379	0.800	1.62	0.631	1.24
293	ICP-MS	0.4	0.8	1.5	0.6	1.2
399	ICP-MS	0.365	0.858	1.65	0.647	1.33
597	DRC/CC-ICP-MS	0.524	1.13	1.73	0.731	1.22
598	ICP-MS	0.38	0.92	1.82	0.66	1.36
605	ICP-MS	0.361	0.834	1.59	0.642	1.23
606	DRC/CC-ICP-MS	0.371	0.853	1.57	0.605	1.28
632	ICP-MS	0.384	0.905	1.63	0.649	1.28

Summary Statistics

	UE17-11	UE17-12	UE17-13	UE17-14	UE17-15
Robust Mean (x*)	0.38	0.85	1.62	0.64	1.27
Robust SD (s*)	0.03	0.05	0.05	0.05	0.07
Robust RSD (%)	7.9	5.9	3.1	7.8	5.5
Number of Sample Measurements (N)	11	11	11	11	11
Standard Uncertainty (*u*)	0.012	0.019	0.02	0.019	0.026

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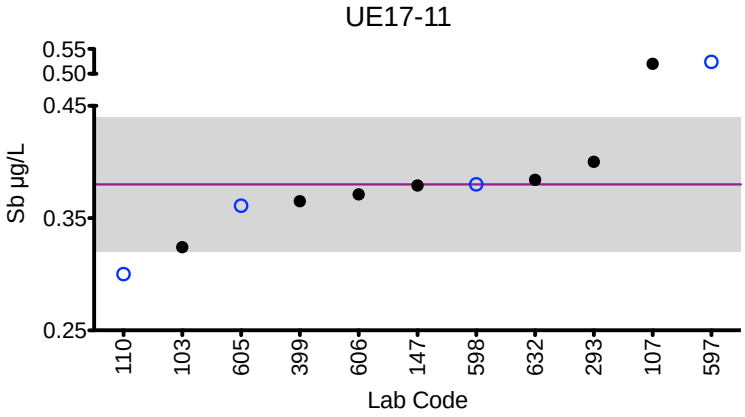
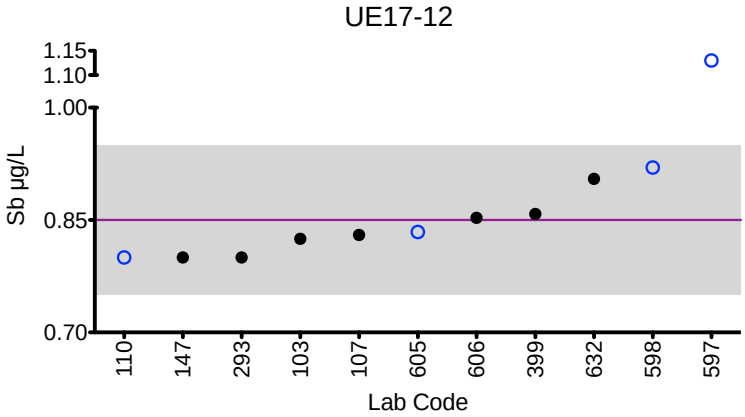
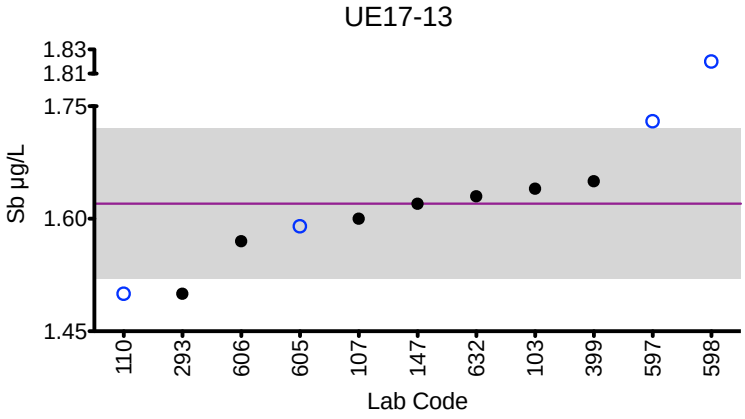
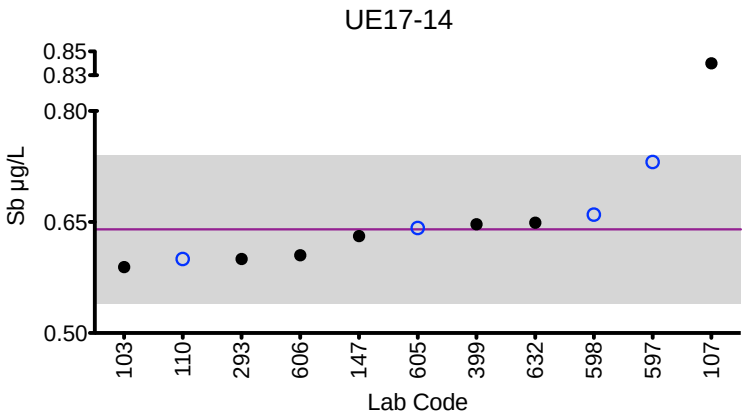
Results for Event #3, 2017: Summary Figures

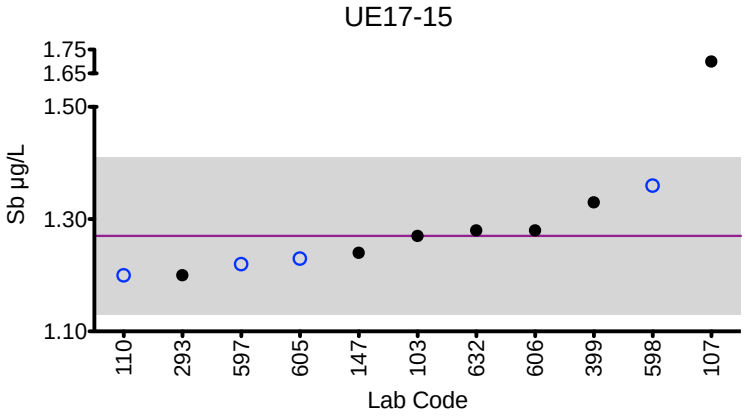
Urine Sb











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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Urine Se (µg/L)

Lab Code	Method	UE17-11	UE17-12	UE17-13	UE17-14	UE17-15
103	DRC/CC-ICP-MS	77.3	168	211	48.3	151
110	DRC/CC-ICP-MS	70.7	162	208	50.4	152
147	ICP-MS	83.7	183	234	54.6	164
597	DRC/CC-ICP-MS	67.4	191	200	48.0	131
598	DRC/CC-ICP-MS	65.4	167.1	217.2	48.1	153.2
632	DRC/CC-ICP-MS	66.8	151	189	45.7	136
684	DRC/CC-ICP-MS	82.0	188	223.0	55.6	166.0

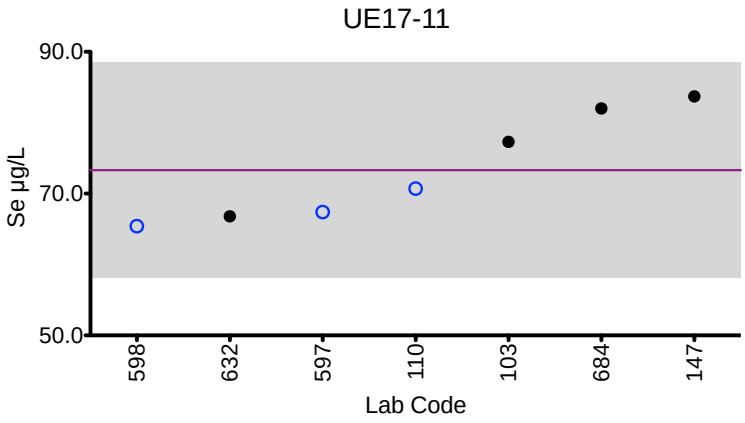
Summary Statistics

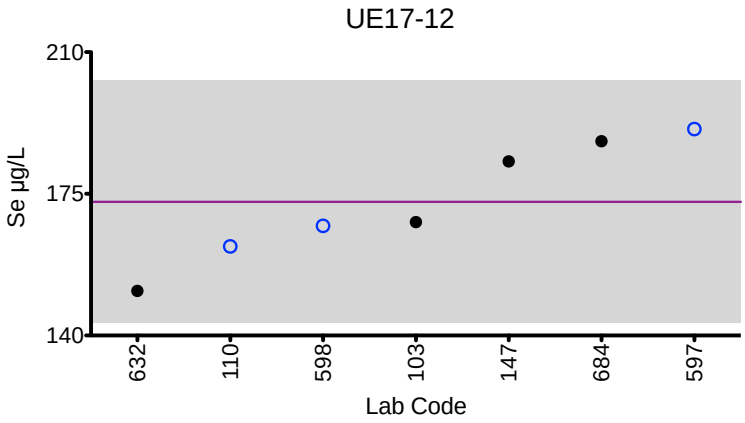
	UE17-11	UE17-12	UE17-13	UE17-14	UE17-15
Arithmetic Mean ($\bar{x}$)	73.3	173	212	50.1	150
Arithmetic SD (s)	7.6	15	15	3.7	13
Arithmetic RSD (%)	10.4	8.7	7.1	7.4	8.7
Number of Sample Measurements (N)	7	7	7	7	7

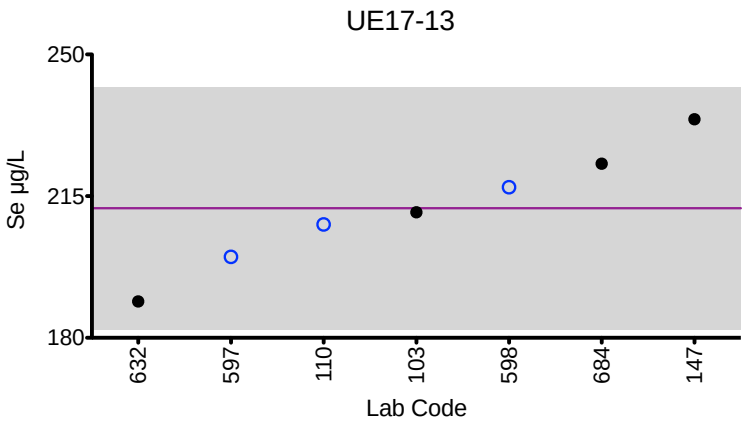
*Denotes a statistical Outlier.

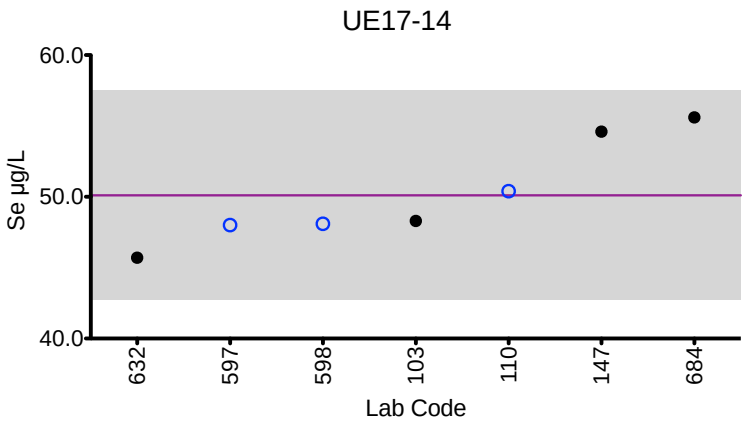
Results for Event #3, 2017:
Summary Figures

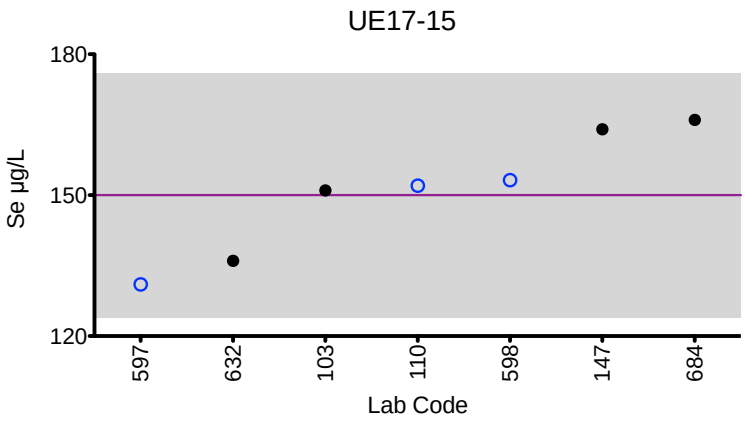
Urine Se











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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Urine Sn (µg/L)

Lab Code	Method	UE17-11	UE17-12	UE17-13	UE17-14	UE17-15
107	ICP-MS	1.9	3.3	1.2	2.8	13
110	ICP-MS	1.6	2.8	1.0	2.5	11.6
147	ICP-MS	1.69	2.92	1.10	2.49	12.5
399	ICP-MS	1.63	2.92	1.01	2.52	12.5
598	ICP-MS	1.93	3.3	1.22	2.76	13.70
599	DRC/CC-ICP-MS	1.11	2.28	1.01	2.09	10.22
605	ICP-MS	1.43	2.57	0.775	2.17	11.6

Summary Statistics

	UE17-11	UE17-12	UE17-13	UE17-14	UE17-15
Arithmetic Mean ($\bar{x}$)	1.6	2.9	1	2.5	12.2
Arithmetic SD (s)	0.3	0.4	0.2	0.3	1.1
Arithmetic RSD (%)	18.8	13.8	20	12	9
Number of Sample Measurements (N)	7	7	7	7	7

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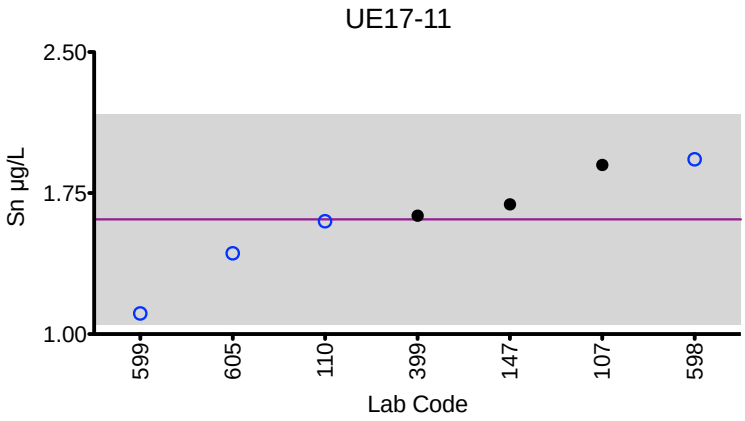
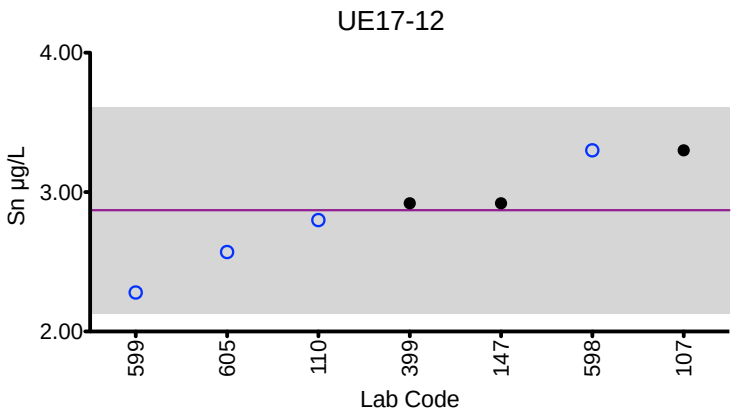
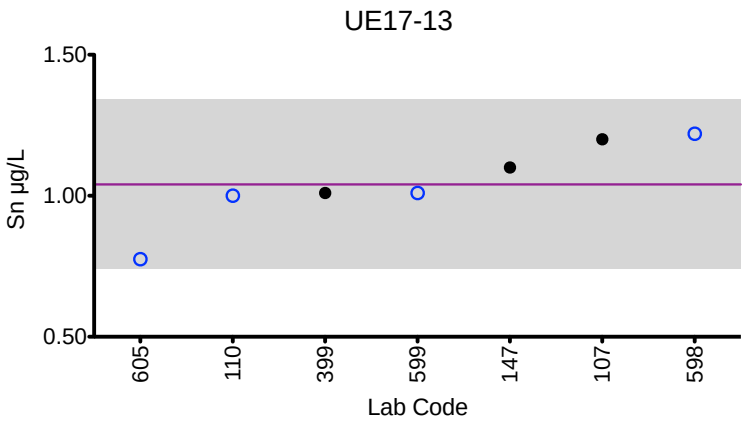
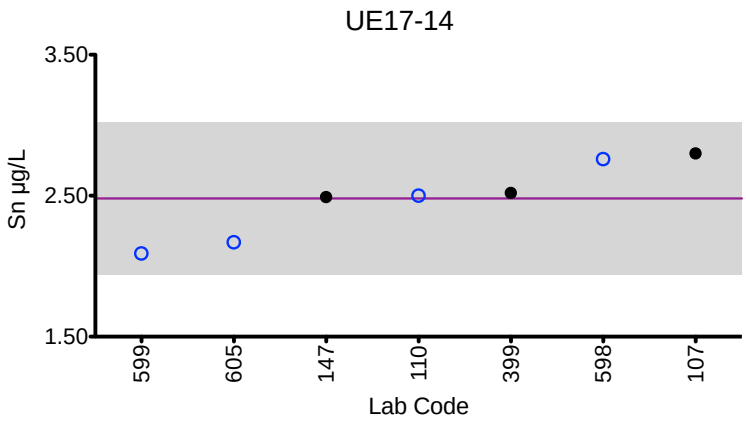
Results for Event #3, 2017: Summary Figures

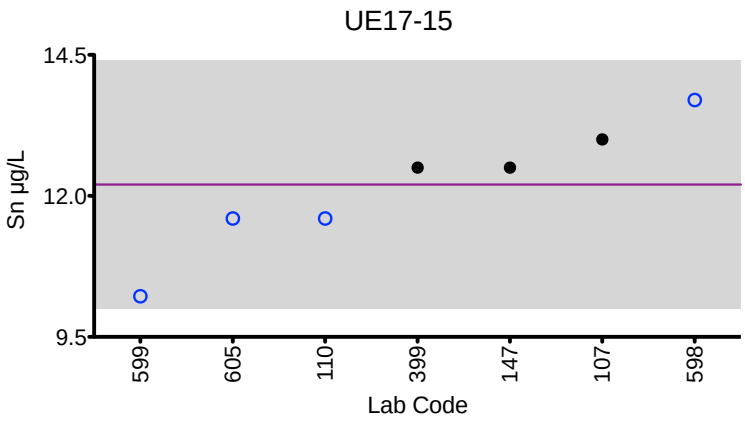
Urine Sn











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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Urine Sr (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
103	DRC/CC-ICP-MS	136	251	60.1	119	279
107	ICP-MS	140	270	62	120	300
200	ICP-MS	123.5	246.2	57.8	120.0	270.7
399	DRC/CC-ICP-MS	138	251	60.8	120	282
605	ICP-MS	134	242	58.6	116	275
Summary Statistics						
		UE17-11	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
Arithmetic Mean ($\bar{x}$)		134	252	59.9	119	281
Arithmetic SD (s)		6	11	1.7	2	11
Arithmetic RSD (%)		4.5	4.4	2.8	1.7	3.9
Number of Sample Measurements (N)		5	5	5	5	5

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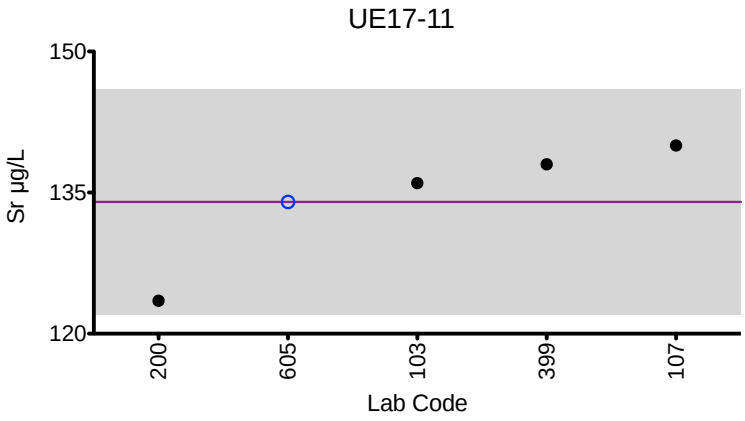
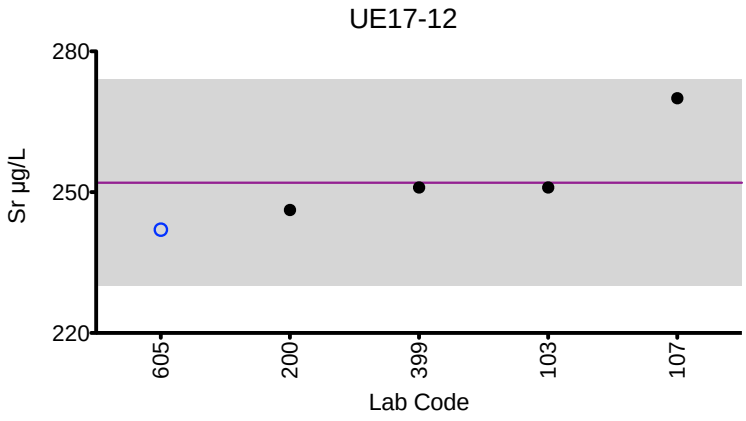
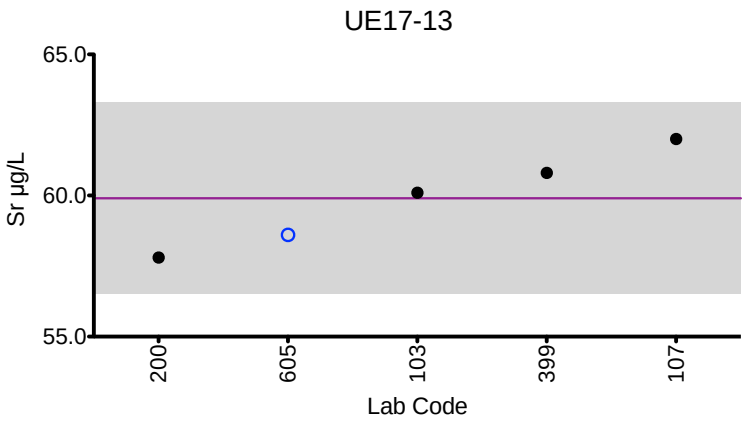
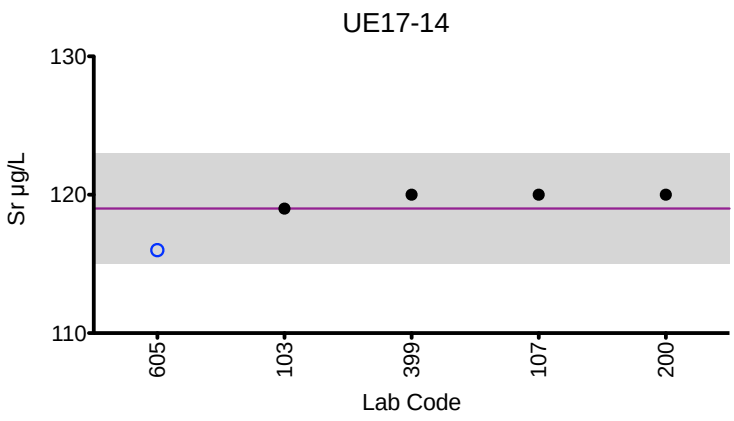
Results for Event #3, 2017: Summary Figures

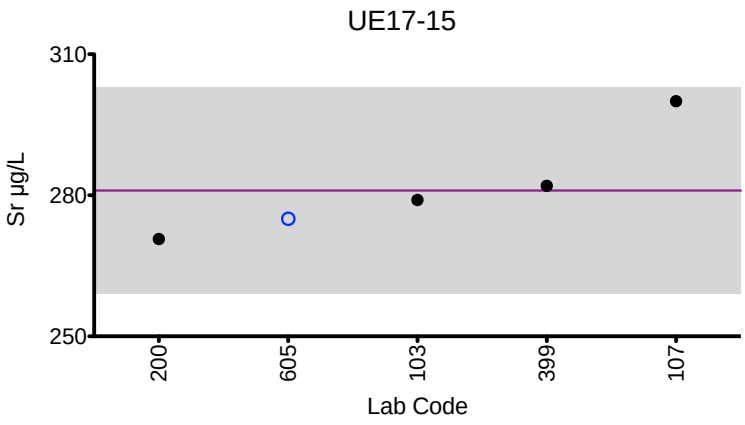
Urine Sr











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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Urine V (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
116	DRC/CC-ICP-MS	0.821	0.399	1.50	1.23	6.06
147	DRC/CC-ICP-MS	0.776	0.360	1.30	1.00	5.31
293	ICP-MS	0.97	0.6	1.67	1.41	6.22
485	HR-ICP-MS	0.856	0.394	1.57	1.25	6.41
597	DRC/CC-ICP-MS	0.835	0.519	1.42	1.17	5.08
598	DRC/CC-ICP-MS	0.97	0.56	1.85	1.43	6.93
Summary Statistics						
		UE17-11	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
Arithmetic Mean ($\bar{x}$)		0.87	0.47	1.55	1.25	6
Arithmetic SD (s)		0.08	0.1	0.19	0.16	0.69
Arithmetic RSD (%)		9.2	21.3	12.3	12.8	11.5
Number of Sample Measurements (N)		6	6	6	6	6

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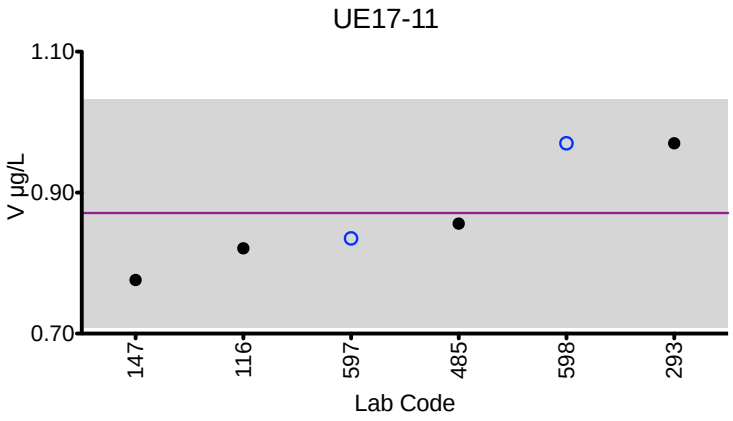
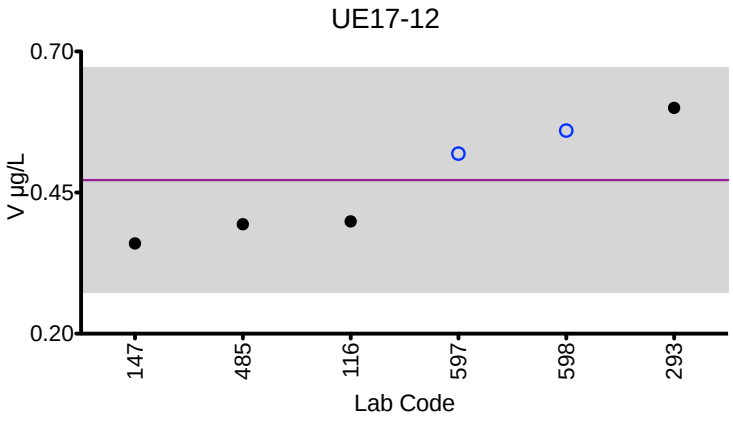
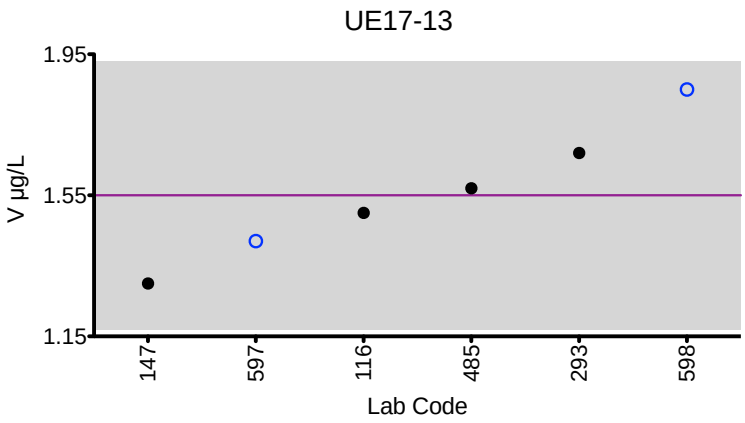
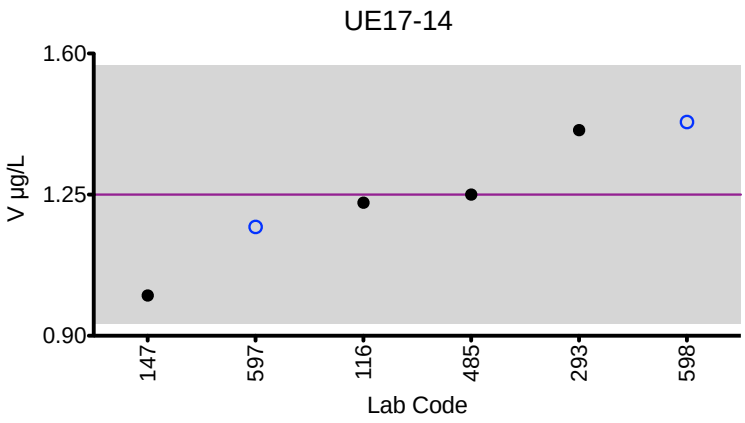
Results for Event #3, 2017: Summary Figures

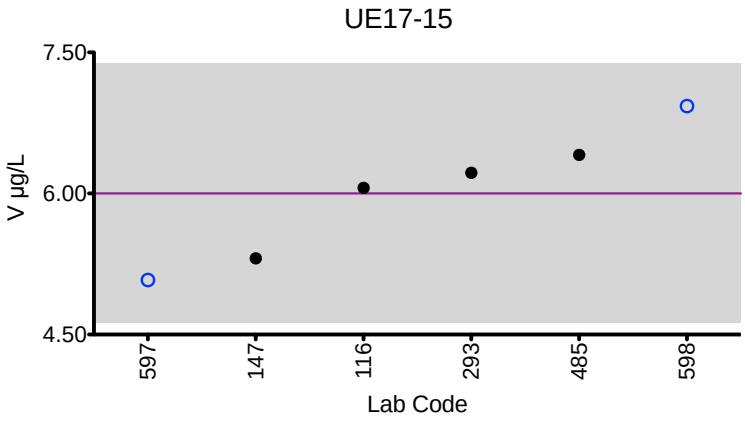
Urine V











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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Urine W (µg/L)

Lab Code	Method	UE17-11	UE17-12	UE17-13	UE17-14	UE17-15
107	ICP-MS	0.36	1.5	0.87	0.55	1.2
110	ICP-MS	0.39	1.60	0.96	0.63	1.28
147	ICP-MS	0.638	1.58	0.896	0.539	1.24
200	ICP-MS	0.54	1.75	0.98	0.64	1.38
324	ICP-MS	<1	1.51	<1	<1	1.22
399	ICP-MS	0.313	1.530	0.880	0.552	1.23
598	ICP-MS	0.40	1.70	*1.21	0.59	1.30
605	ICP-MS	0.311	1.50	0.860	0.542	1.24
606	DRC/CC-ICP-MS	0.306	1.52	0.875	0.544	1.26

Summary Statistics

	UE17-11	UE17-12	UE17-13	UE17-14	UE17-15
Arithmetic Mean ($\bar{x}$)	0.41	1.58	0.9	0.57	1.26
Arithmetic SD (s)	0.12	0.09	0.05	0.04	0.05
Arithmetic RSD (%)	29.3	5.7	5.6	7	4
Number of Sample Measurements (N)	8	9	7	8	9

*Denotes a statistical Outlier.

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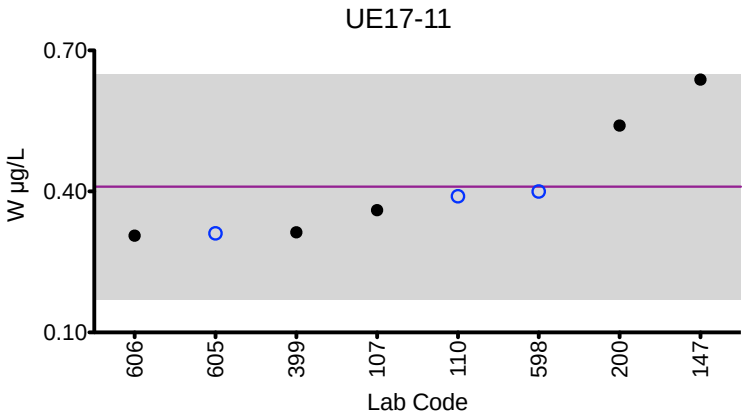
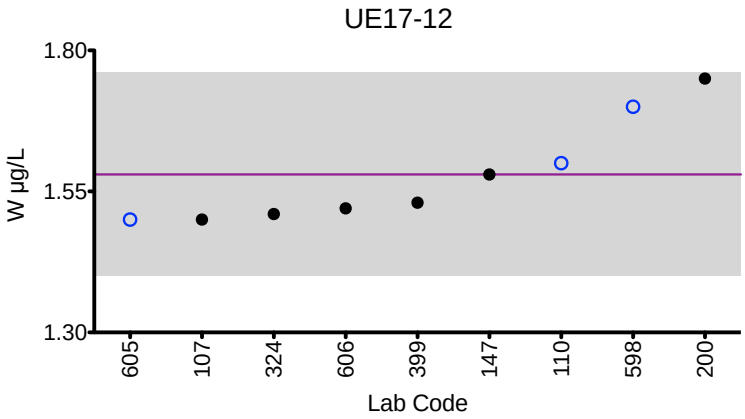
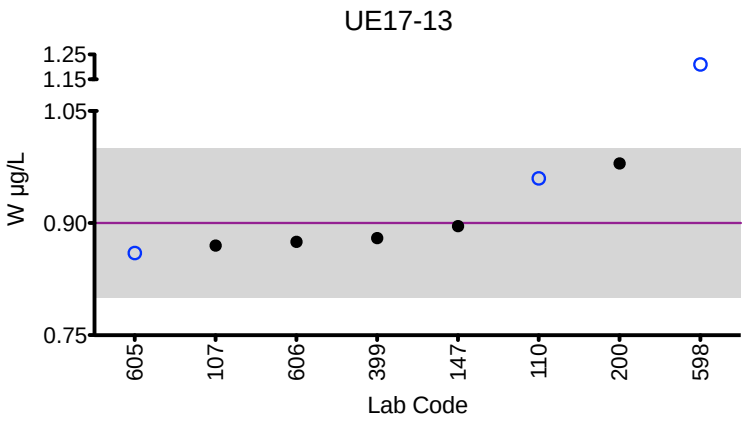
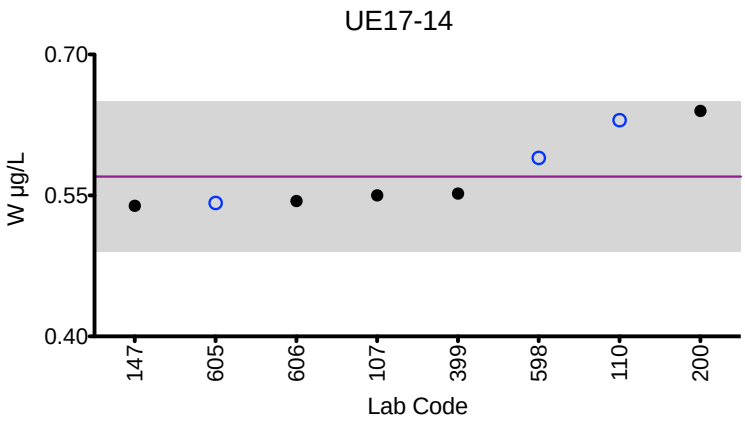
Results for Event #3, 2017: Summary Figures

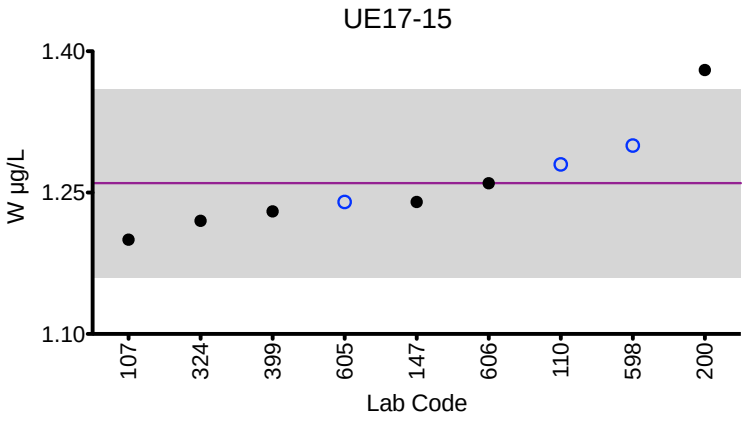
Urine W











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 #3, 2017:
Laboratory Data and Summary Statistics

Urine Zn (µg/L)

Lab Code	Method	UE17-11	UE17-12	UE17-13	UE17-14	UE17-15
110	ICP-MS	354	874	435	883	1335
147	ICP-MS	356	876	449	902	1399
293	ICP-MS	342.5	907.8	460.1	902.6	1333.3
324	ICP-MS	335.53	844.73	417.25	837.74	1272.46
401	DRC/CC-ICP-MS	366	915	451	883	1373
597	DRC/CC-ICP-MS	299	976	384	753	*1061
598	ICP-MS	315	837	436	834	1333
599	DRC/CC-ICP-MS	300	867	383	866	1364
632	ICP-MS	377	985	465	951	1459

Summary Statistics

	UE17-11	UE17-12	UE17-13	UE17-14	UE17-15
Arithmetic Mean ($\bar{x}$)	338	898	431	868	1359
Arithmetic SD (s)	28	53	31	56	55
Arithmetic RSD (%)	8.3	5.9	7.2	6.5	4
Number of Sample Measurements (N)	9	9	9	9	8

*Denotes a statistical Outlier.

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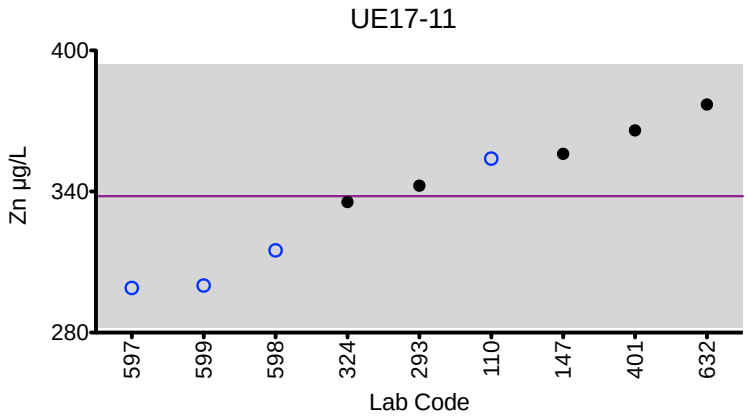
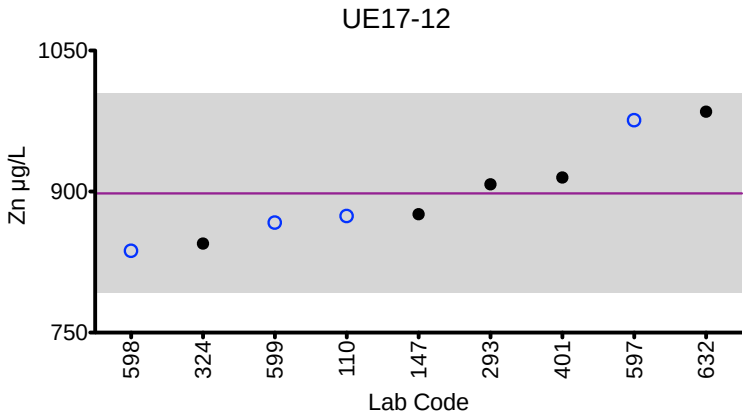
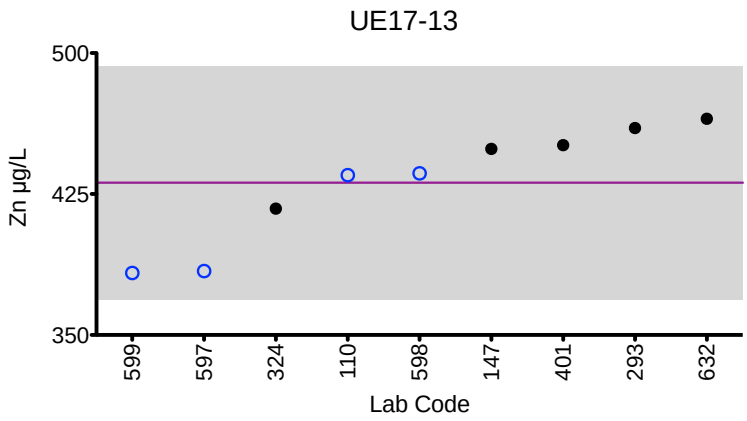
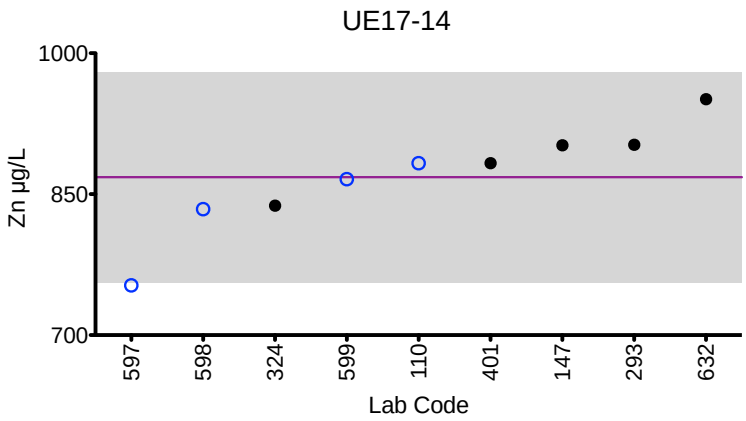
Results for Event #3, 2017: Summary Figures

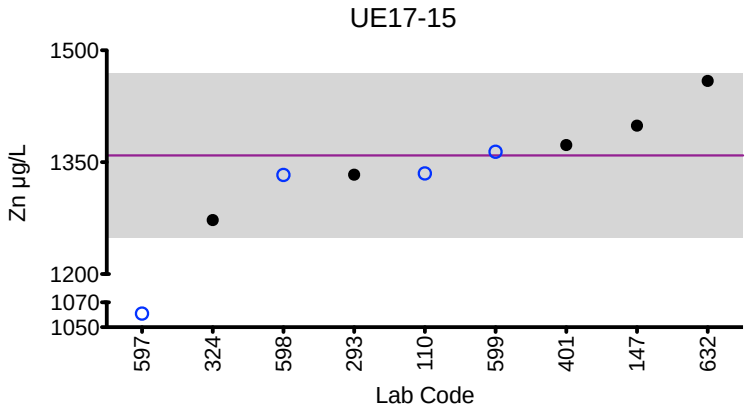
Urine Zn











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 #3, 2017:
Laboratory Data and Summary Statistics

Urine Al (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
147	DRC/CC-ICP-MS	<13.8	18.0	16.7	<13.8	26.4
324	ICP-MS	9.63	17.46	18.83	11.90	25.61
485	HR-ICP-MS	5.56	12.3	16.7	8.93	28.7
597	DRC/CC-ICP-MS	1.60	12.0	15.4	5.50	21.7

Summary Statistics					
	UE17-11	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
Arithmetic Mean ($\bar{x}$)	NA	NA	16.9	NA	26
Arithmetic SD (s)	NA	NA	1.4	NA	3
Arithmetic RSD (%)	NA	NA	8.3	NA	11.5
Number of Sample Measurements (N)	NA	NA	4	NA	4

*Denotes a statistical Outlier.

Statistics for UE17-11, UE17-12, and UE17-14 were not calculated based on a lack of consensus among participating laboratories.

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Results for Event #3, 2017: Additional Elements in Urine

Urine Ag (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
147	ICP-MS	< 0.302	< 0.302	< 0.302	< 0.302	< 0.302
Urine B (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
200	ICP-MS	1253	1501	1307	799	994
Urine Bi (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
147	ICP-MS	< 0.230	< 0.230	< 0.230	< 0.230	< 0.230
Urine Fe (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
324	ICP-MS	7.93	10.61	9.30	8.85	7.78
Urine I (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
107	ICP-MS	43	100	43	130	100
Urine Li (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
147	ICP-MS	35.9	24.0	36.6	15.0	16.6
Urine Mg (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
597	DRC/CC-ICP-MS	31800	78200	34500	13800	28500
Urine Te (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
110	ICP-MS	1.1	1.0	0.3	0.7	2.4
Urine Th (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
147	ICP-MS	< 0.00557	< 0.00557	< 0.00557	< 0.00557	< 0.00557
Urine Ti (µg/L)						
Lab Code	**Method**	**UE17-11**	**UE17-12**	**UE17-13**	**UE17-14**	**UE17-15**
485	HR-ICP-MS	<0.5	<0.5	<0.5	5.96	24.6

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Event #3, 2017

Trace Elements in Serum

Wadsworth Center
NEW YORK STATE DEPARTMENT OF HEALTH
Trace Elements Laboratory

Event #3, 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, 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 #3, 2017:
Summary Statistics

	Serum Al (µg/L)				
	SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Target (Arithmetic Mean ($\bar{x}$))	56.2	93	147	196	29.4
Upper Limit	67.44	111.6	176.4	235.2	35.28
Lower Limit	44.96	74.4	117.6	156.8	23.52
Arithmetic SD (s)	4.5	5.4	14	22	3.0
Arithmetic RSD (%)	8.0	5.8	9.5	11.2	10.2
Number of Sample Measurements (N)	6	6	6	6	6

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 #3, 2017:
Performance of Participating Laboratories

		Serum Al (µg/L)				
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
	Target	**56.2**	**93**	**147**	**196**	**29.4**
147	ETAAS-Z	54.0	87.8	134	173	28
200	DRC/CC-ICP-MS	48.60	89.6	130	169.3	25.7
293	ICP-MS	58.87	92.74	145.7	197.9	32.26
391	ETAAS-Z	72.14 ↑	88.15	171.5	214	50.65 ↑
485	HR-ICP-MS	55.80	90.7	154	202	28.80
597	DRC/CC-ICP-MS	59.1	103	167	226	33.7
598	ICP-MS	60.8	94.3	150.9	209.5	27.9

Based on the grading criteria for Al in Serum, 94% of results were satisfactory, with 1 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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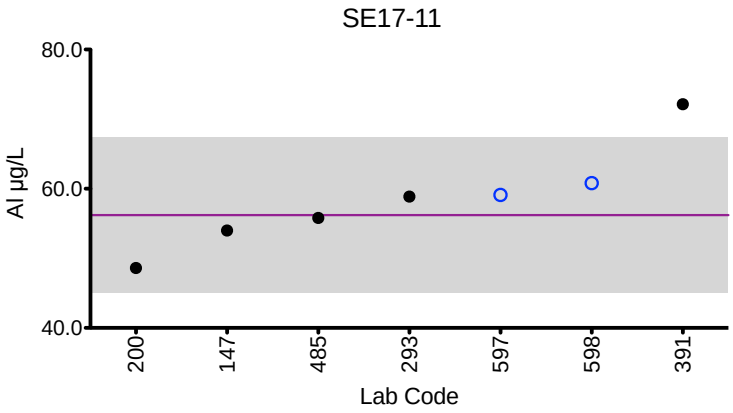
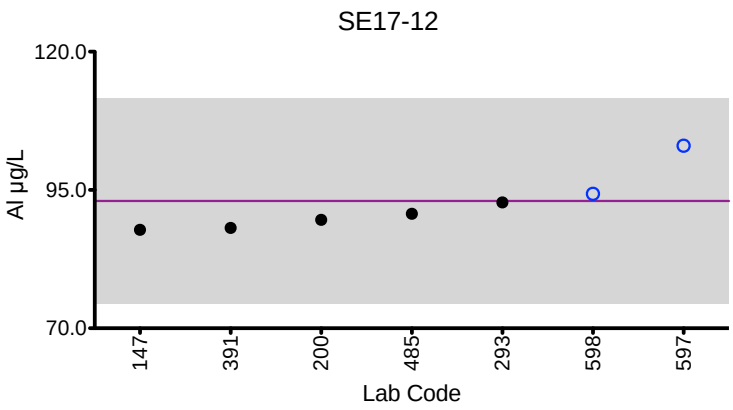
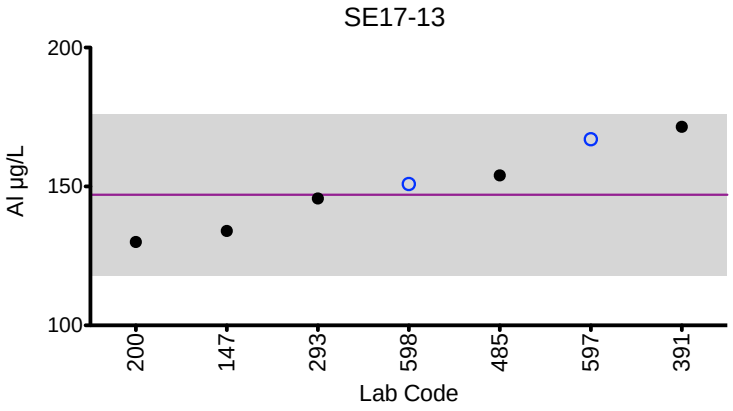
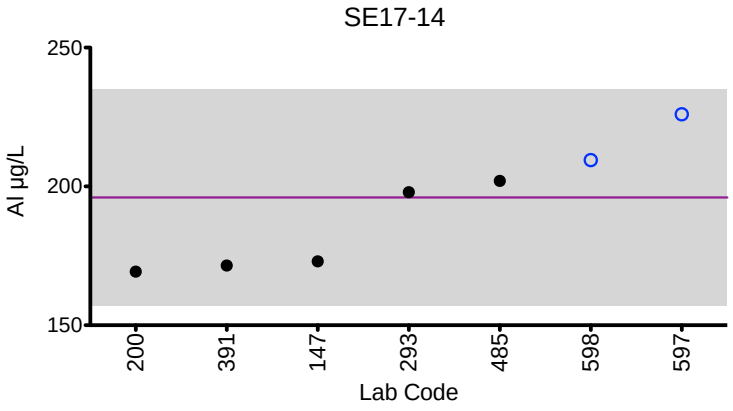
Results for Event #3, 2017: Summary Figures

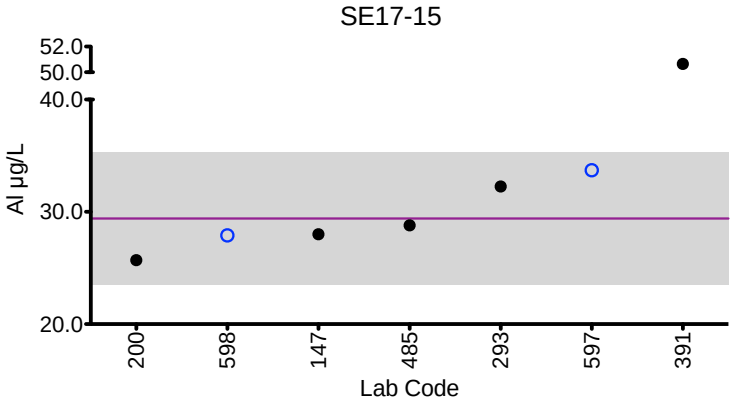
Serum Al











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 #3, 2017: Summary Statistics

	Serum Co (µg/L)				
	SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Target (Arithmetic Mean ($\bar{x}$))	6.6	3.5	4.1	1.1	10.7
Upper Limit	8.1	5	5.6	2.6	12.305
Lower Limit	5.1	2	2.6	0	9.095
Arithmetic SD (s)	0.3	0.2	0.3	0.2	0.7
Arithmetic RSD (%)	4.5	5.7	7.3	18.2	6.5
Number of Sample Measurements (N)	7	7	6	7	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.

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Results for Event #3, 2017:
Performance of Participating Laboratories

Serum Co (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
	Target	**6.6**	**3.5**	**4.1**	**1.1**	**10.7**
103	DRC/CC-ICP-MS	6.27	3.25	3.85	1.00	10.3
110	ICP-MS	6.58	3.48	3.99	1.14	10.9
147	ICP-MS	6.36	3.31	3.77	0.984	10.3
293	ICP-MS	6.41	3.43	*22.37 ↑	1.08	10.13
485	HR-ICP-MS	6.60	3.48	4.28	1.03	11.1
597	DRC/CC-ICP-MS	7.02	3.84	4.61	1.27	12.0
598	ICP-MS	6.72	3.79	4.35	1.46	10.38
599	DRC/CC-ICP-MS	*11.7 ↑	*6.62 ↑	*7.94 ↑	*2.40	*15.7 ↑

Based on the grading criteria for Co in Serum, 88% of results were satisfactory, with 1 of the 8 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

* Denotes a statistical Outlier

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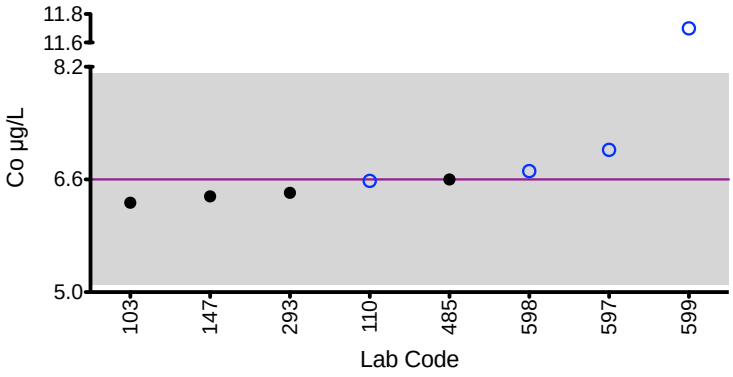
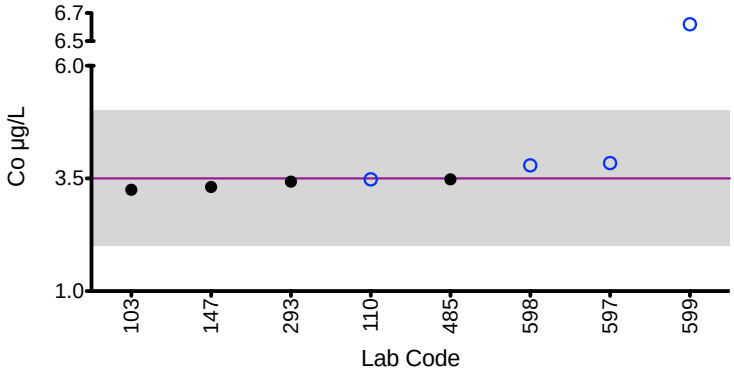
Results for Event #3, 2017: Summary Figures

Serum Co

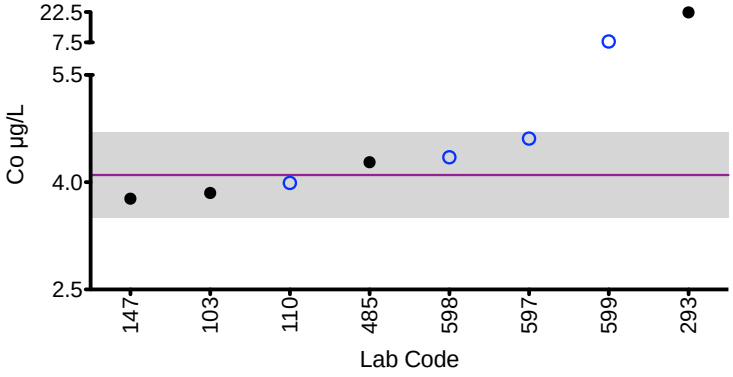
SE17-11



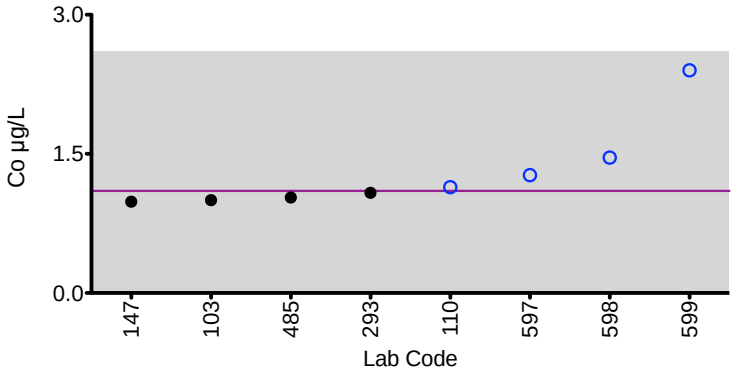
SE17-12



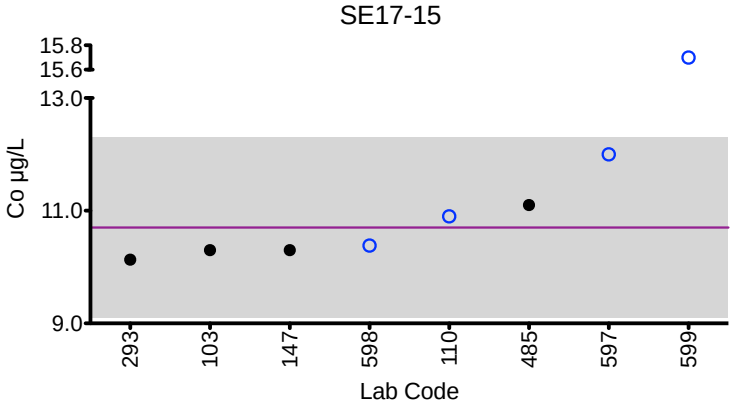
SE17-13



SE17-14



SE17-15



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 #3, 2017: Summary Statistics

	Serum Cr (µg/L)				
	SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Target (Arithmetic Mean ($\bar{x}$))	0.91	2.8	4.1	1.1	10.1
Upper Limit	2.91	4.8	6.1	3.1	12.12
Lower Limit	0	0.8	2.1	0	8.08
Arithmetic SD (s)	0.09	0.2	0.2	0.1	0.5
Arithmetic RSD (%)	9.9	7.1	4.9	9.1	5.0
Number of Sample Measurements (N)	6	6	5	6	6

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.

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Results for Event #3, 2017:
Performance of Participating Laboratories

Serum Cr (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
	Target	**0.91**	**2.8**	**4.1**	**1.1**	**10.1**
103	DRC/CC-ICP-MS	0.792	2.66	4.04	0.982	10.0
110	DRC/CC-ICP-MS	0.9	2.8	4.2	1.1	10.7
147	DRC/CC-ICP-MS	0.832	2.49	3.75	1.00	9.31
293	ICP-MS	0.97	3.04	*37.89 ↑	1.27	9.88
485	HR-ICP-MS	0.899	2.93	4.25	1.00	10.4
597	DRC/CC-ICP-MS	*3.12 ↑	*5.57 ↑	*7.13 ↑	*4.07 ↑	*14.3 ↑
598	DRC/CC-ICP-MS	1.05	2.87	4.13	0.99	10.2

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

* Denotes a statistical Outlier

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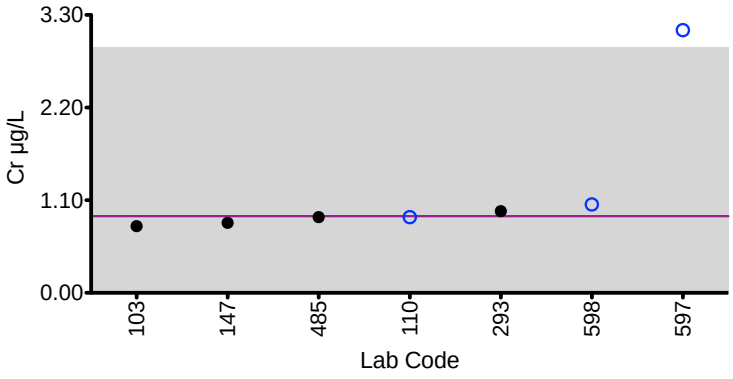
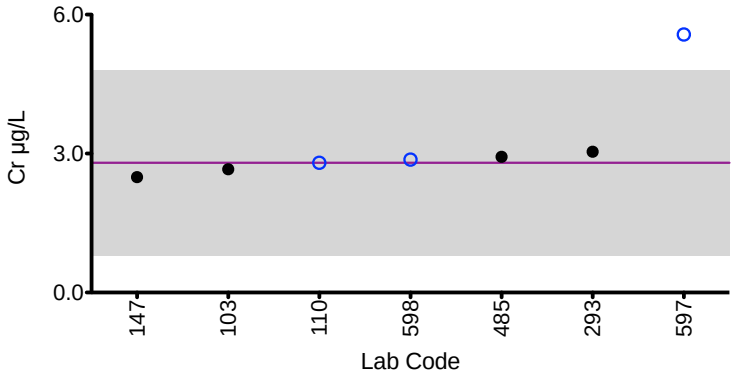
Results for Event #3, 2017: Summary Figures

Serum Cr

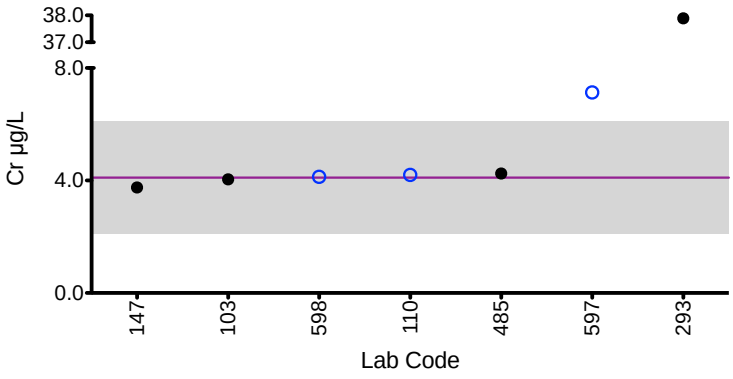
SE17-11



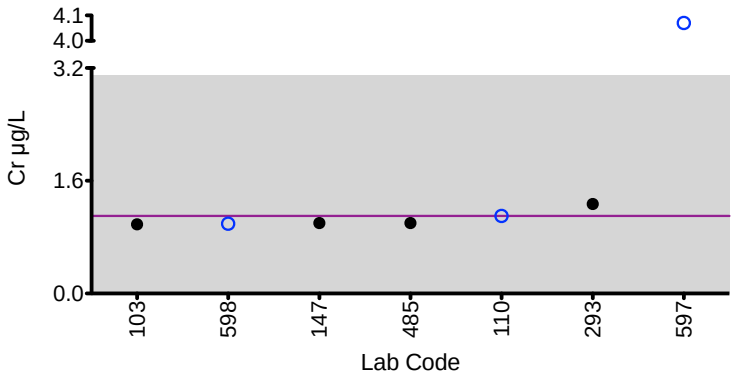
SE17-12



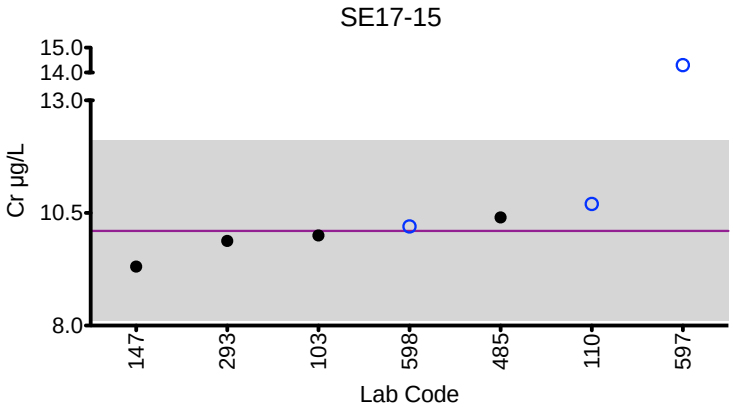
SE17-13



SE17-14



SE17-15



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 #3, 2017:
Summary Statistics

Serum Cu (µg/L)					
	SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Target (Arithmetic Mean ($\bar{x}$))	2614	1657	1037	966	775
Upper Limit	3006.1	1905.55	1192.55	1110.9	891.25
Lower Limit	2221.9	1408.45	881.45	821.1	658.75
Arithmetic SD (s)	161	70	66	70	45
Arithmetic RSD (%)	6.2	4.2	6.4	7.2	5.8
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 #3, 2017:
Performance of Participating Laboratories

Serum Cu (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
	Target	**2614**	**1657**	**1037**	**966**	**775**
107	DRC/CC-ICP-MS	2800	1700	1100	990	810
110	ICP-MS	2730	1700	1040	985	813
147	ICP-MS	2598	1607	997	934	769
200	ICP-MS	2261	1581	921	838	756
293	ICP-MS	2614.1	1587.4	1022.3	938.3	733.6
457	ICP-AES/OES	2667	1712	1049	1010	789
483	DRC/CC-ICP-MS	2660	1680	1010	953	766
597	DRC/CC-ICP-MS	2720	1770	1160	1100	841
598	ICP-MS	2479	1577	1031	949	693

Based on the grading criteria for Cu in Serum, 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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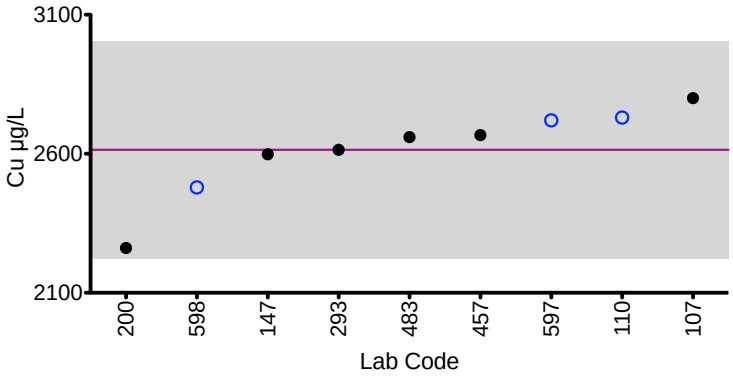
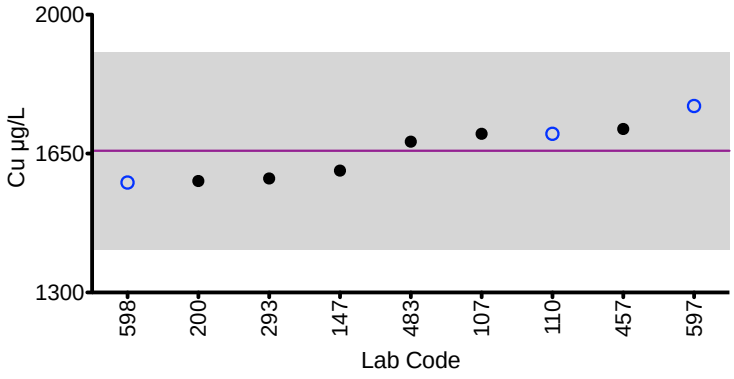
Results for Event #3, 2017: Summary Figures

Serum Cu

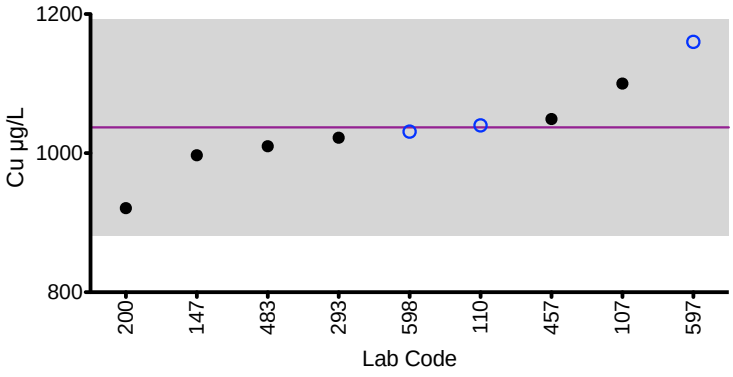
SE17-11



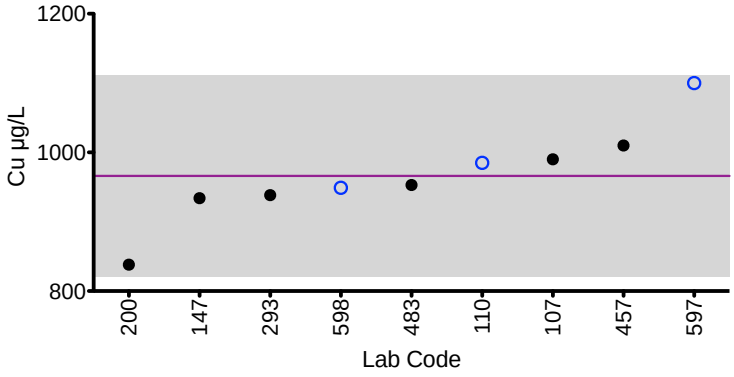
SE17-12



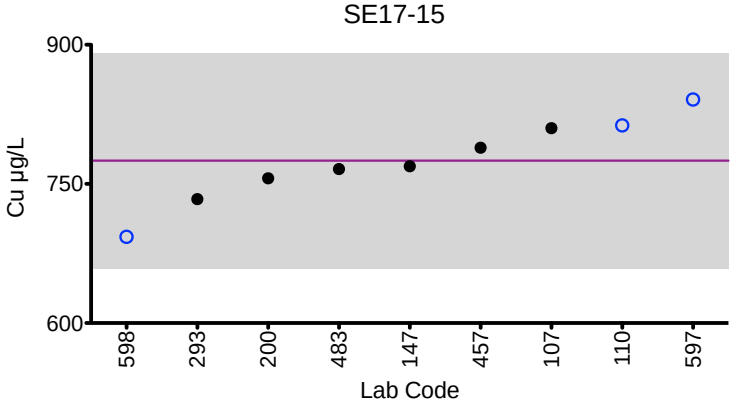
SE17-13



SE17-14



SE17-15



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 #3, 2017:
Summary Statistics

	Serum Se (µg/L)				
	SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Target (Arithmetic Mean ($\bar{x}$))	175	128	262	212	148
Upper Limit	210	153.6	314.4	254.4	177.6
Lower Limit	140	102.4	209.6	169.6	118.4
Arithmetic SD (s)	15	9	25	23	11
Arithmetic RSD (%)	8.6	7.0	9.5	10.8	7.4
Number of Sample Measurements (N)	9	9	9	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 #3, 2017:
Performance of Participating Laboratories

		Serum Se (µg/L)				
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
	Target	**175**	**128**	**262**	**212**	**148**
103	DRC/CC-ICP-MS	183	132	278	226	155
107	DRC/CC-ICP-MS	160	120	250	200	140
110	DRC/CC-ICP-MS	175	122	251	208	145
147	ICP-MS	171	119	236	193	137
200	DRC/CC-ICP-MS	146.2	120.1	226.7	178.5	136.7
293	ICP-MS	187.9	128.7	280.9	223.4	146.8
483	DRC/CC-ICP-MS	179	130	254	211	145
597	DRC/CC-ICP-MS	194	146	306	261 ↑	172
598	DRC/CC-ICP-MS	183	134	271	211	152

Based on the grading criteria for Se in Serum, 98% 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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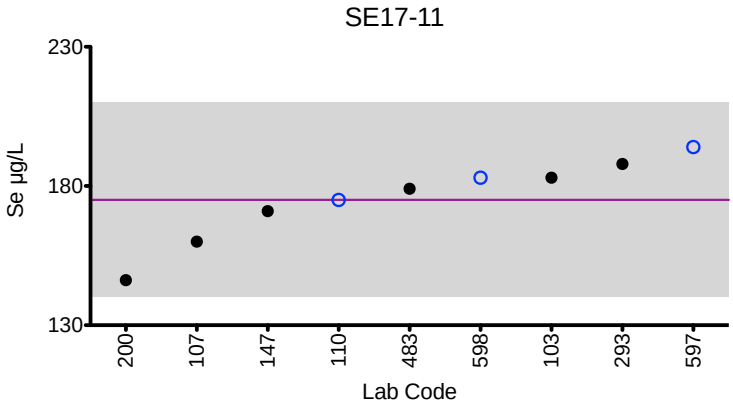
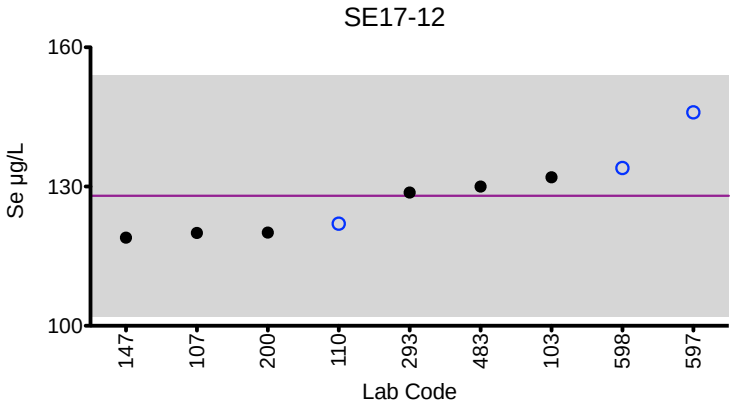
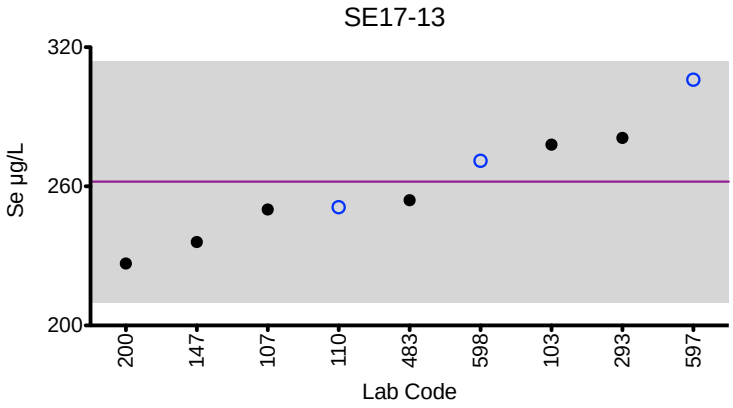
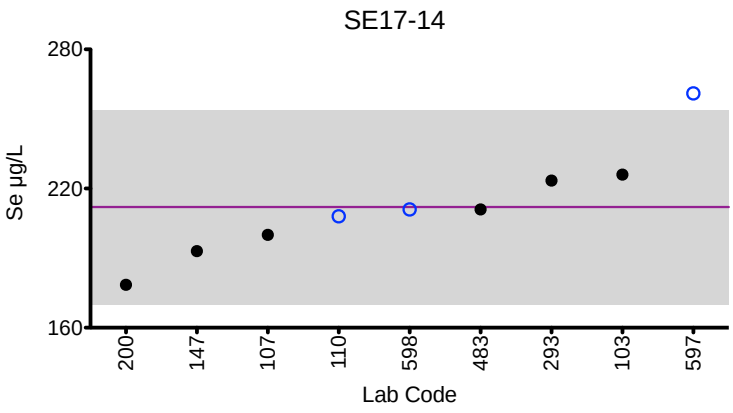
Results for Event #3, 2017: Summary Figures

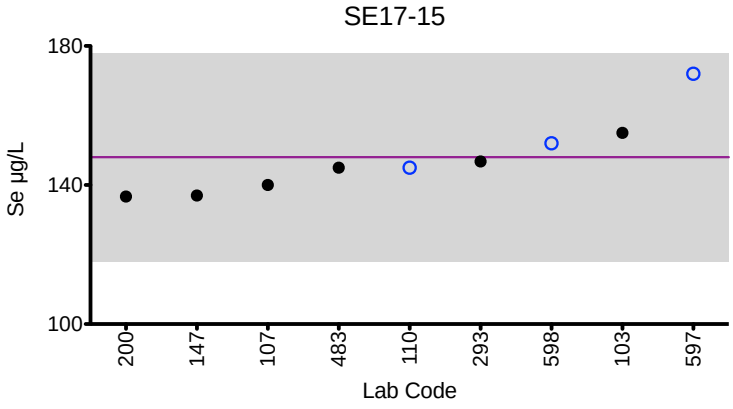
Serum Se











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 #3, 2017:
Summary Statistics

Serum Zn (µg/L)					
	SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Target (Arithmetic Mean ($\bar{x}$))	795	2019	1600	1337	785
Upper Limit	914.25	2321.85	1840	1537.55	902.75
Lower Limit	675.75	1716.15	1360	1136.45	667.25
Arithmetic SD (s)	61	123	119	104	56
Arithmetic RSD (%)	7.7	6.1	7.4	7.8	7.1
Number of Sample Measurements (N)	9	9	9	9	9

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 #3, 2017:
Performance of Participating Laboratories

Serum Zn (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
	Target	**795**	**2019**	**1600**	**1337**	**785**
107	DRC/CC-ICP-MS	900	2200	1700	1400	830
110	ICP-MS	808	2020	1620	1340	820
147	ICP-MS	778	1954	1536	1268	745
200	ICP-MS	693	2001	1465	1184	778
293	ICP-MS	781.7	1926.1	1634.6	1322.2	751
457	ICP-AES/OES	775	1932	1551	1349	818
483	DRC/CC-ICP-MS	843	2090	1590	1340	786
597	DRC/CC-ICP-MS	841	2200	1840 ↑	1560 ↑	860
598	ICP-MS	739	1849	1460	1267	674

Based on the grading criteria for Zn in Serum, 98% 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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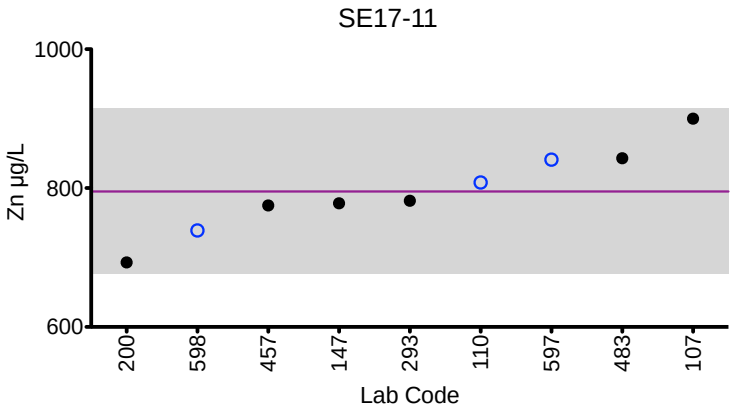
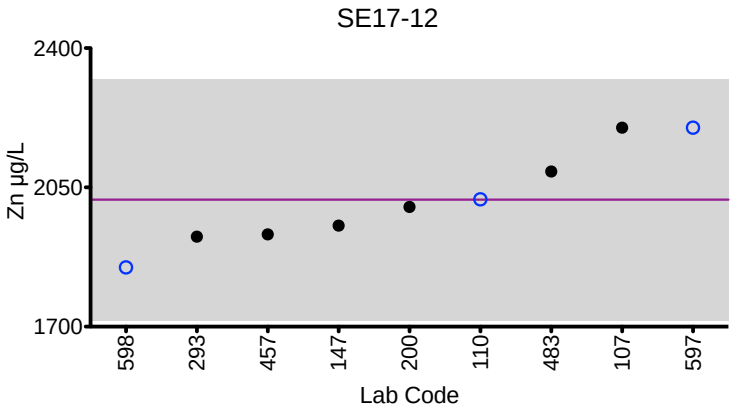
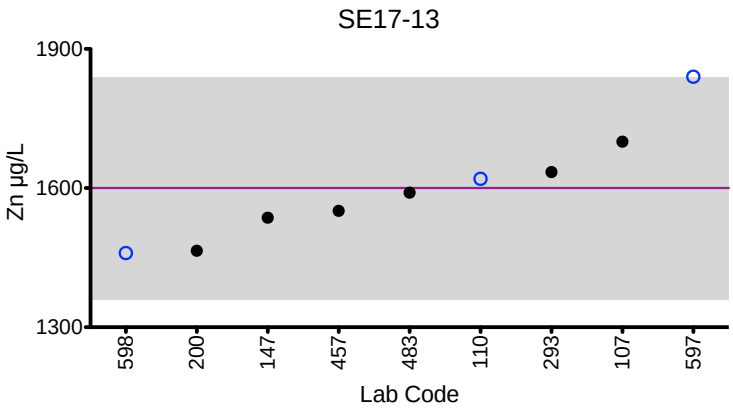
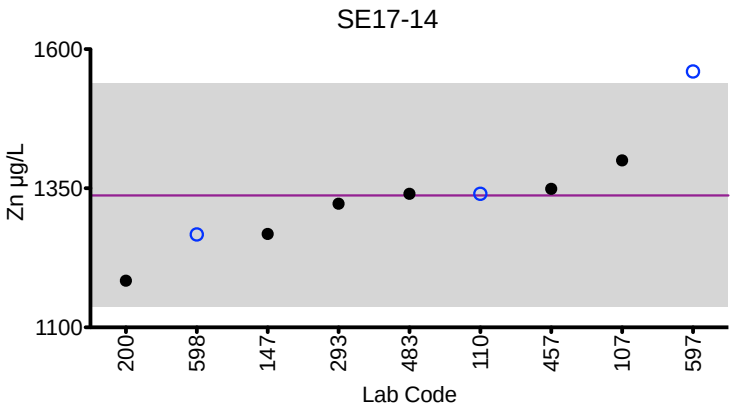
Results for Event #3, 2017: Summary Figures

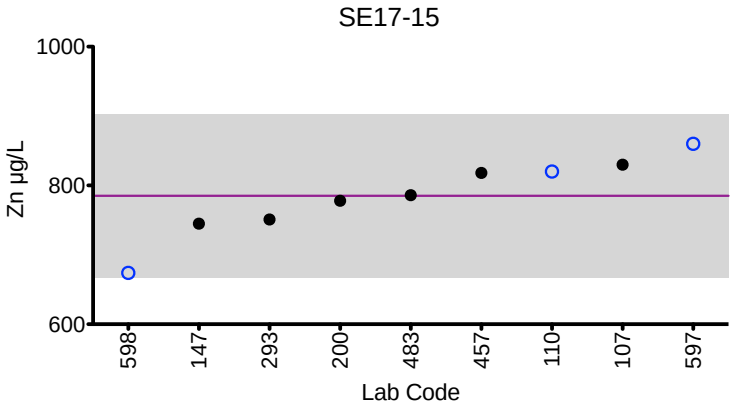
Serum Zn











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 #3, 2017:
Laboratory Data and Summary Statistics

Serum As (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
103	DRC/CC-ICP-MS	12.2	17.9	2.18	9.62	6.37
110	DRC/CC-ICP-MS	11.7	16.8	2.1	8.7	6.4
147	ICP-MS	11.3	15.7	1.56	7.85	5.36
597	DRC/CC-ICP-MS	13.3	19.3	3.57	11.9	8.16
598	DRC/CC-ICP-MS	12.7	18.3	2.12	9.58	6.66
Summary Statistics						
		SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Arithmetic Mean ($\bar{x}$)		12.2	17.6	2.3	9.5	6.6
Arithmetic SD (s)		0.8	1.4	0.7	1.5	1
Arithmetic RSD (%)		6.6	8	30.4	15.8	15.2
Number of Sample Measurements (N)		5	5	5	5	5

*Denotes a statistical Outlier.

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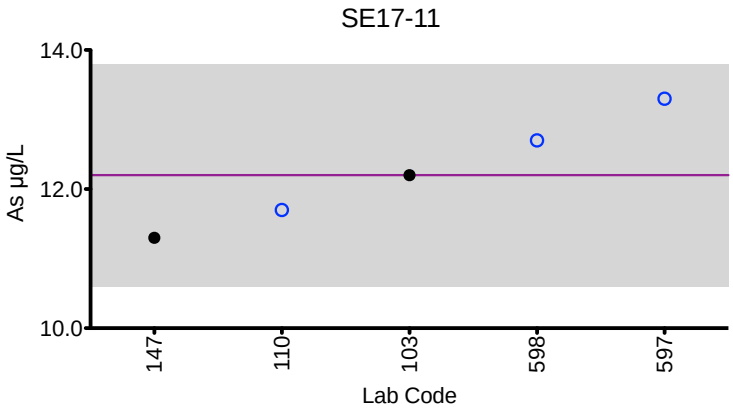
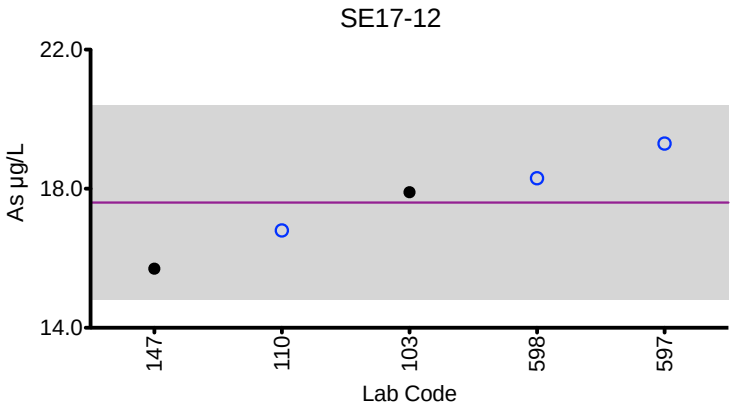
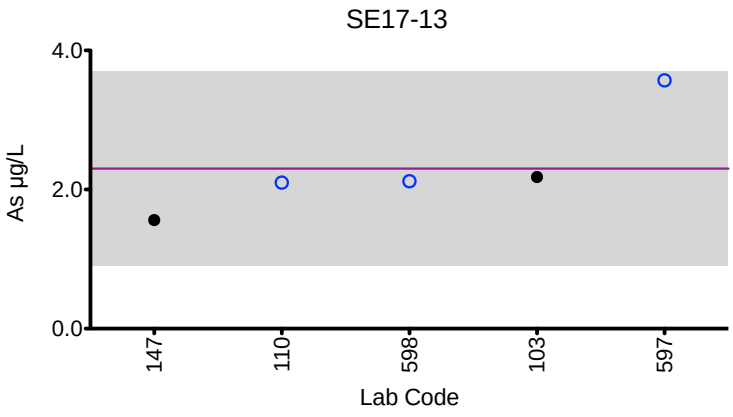
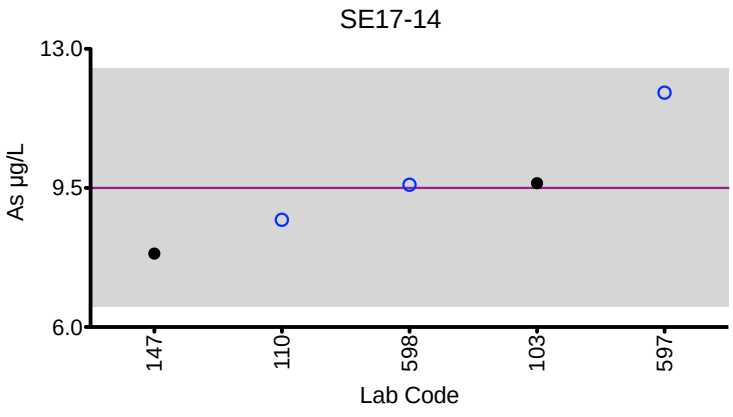
Results for Event #3, 2017: Summary Figures

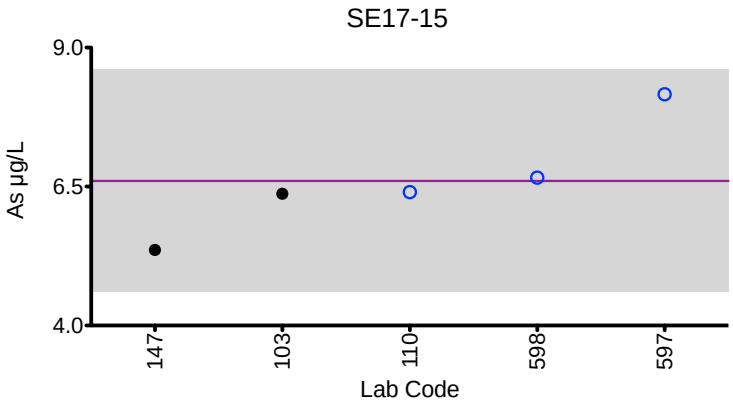
Serum As











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 #3, 2017:
Laboratory Data and Summary Statistics

Serum Cd (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
103	DRC/CC-ICP-MS	4.59	3.76	1.38	0.509	2.65
110	ICP-MS	4.7	3.6	1.2	0.5	2.7
147	ICP-MS	4.42	3.55	1.29	0.483	2.61
597	DRC/CC-ICP-MS	4.64	3.93	1.53	0.499	2.96
598	DRC/CC-ICP-MS	5.02	3.70	1.32	0.51	2.69
599	DRC/CC-ICP-MS	5.69	*4.61	1.60	0.478	*3.58
Summary Statistics						
		SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Arithmetic Mean ($\bar{x}$)		4.8	3.7	1.4	0.5	2.7
Arithmetic SD (s)		0.5	0.1	0.2	0.01	0.1
Arithmetic RSD (%)		10.4	2.7	14.3	2	3.7
Number of Sample Measurements (N)		6	5	6	6	5

*Denotes a statistical Outlier.

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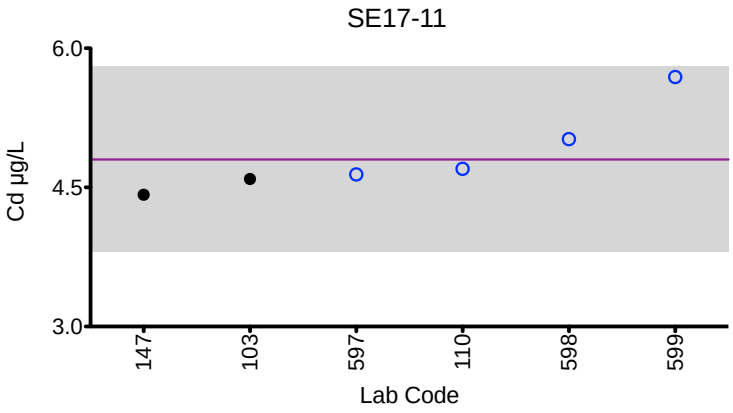
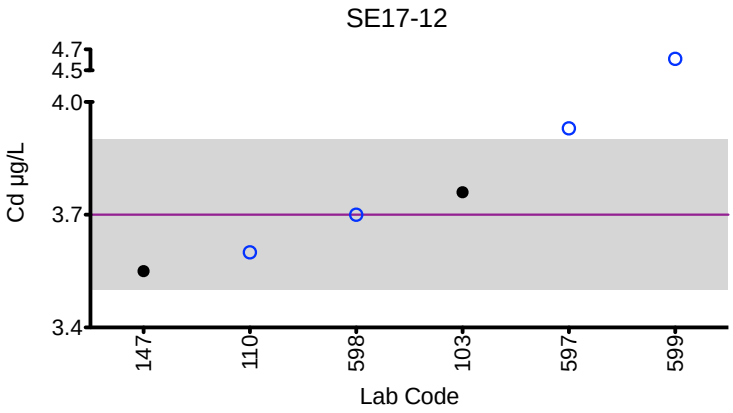
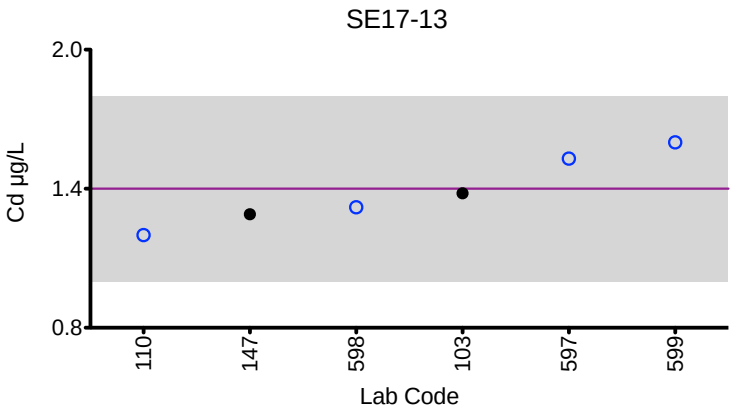
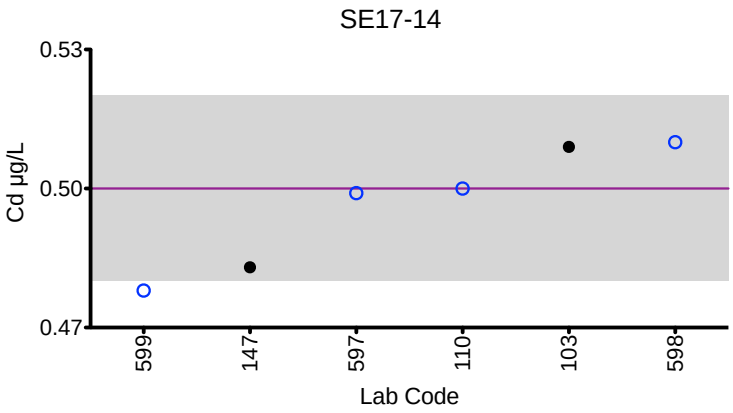
Results for Event #3, 2017: Summary Figures

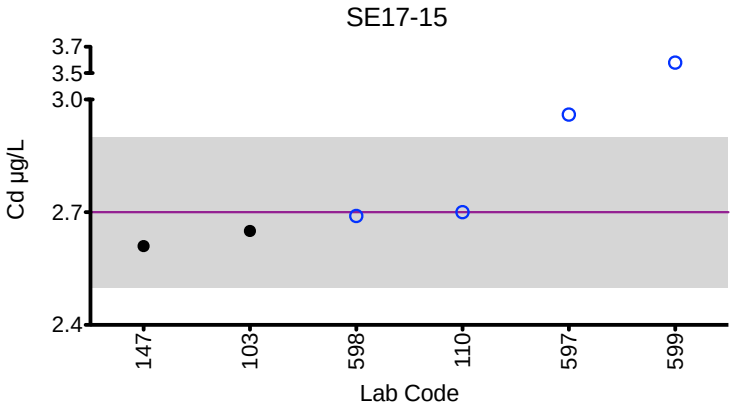
Serum Cd











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 #3, 2017:
Laboratory Data and Summary Statistics

Serum Mn (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
103	DRC/CC-ICP-MS	10.2	1.63	2.01	4.15	16.8
110	ICP-MS	10.1	1.7	2.0	4.3	16.9
147	ICP-MS	10.0	1.70	2.13	4.31	16.3
293	ICP-MS	10.19	1.72	2.32	4.26	16.06
597	DRC/CC-ICP-MS	10.4	*2.14	2.63	5.02	17.4
598	ICP-MS	10.0	1.76	2.18	4.55	16.2
Summary Statistics						
		SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Arithmetic Mean ($\bar{x}$)		10.1	1.7	2.2	4.4	16.6
Arithmetic SD (s)		0.2	0.1	0.2	0.3	0.5
Arithmetic RSD (%)		2	5.9	9.1	6.8	3
Number of Sample Measurements (N)		6	5	6	6	6

*Denotes a statistical Outlier.

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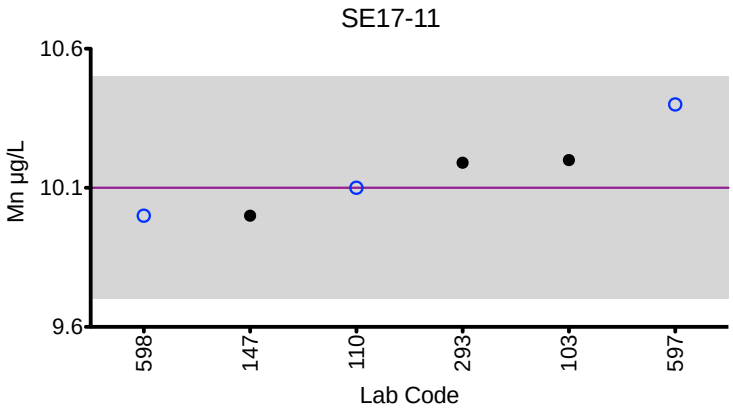
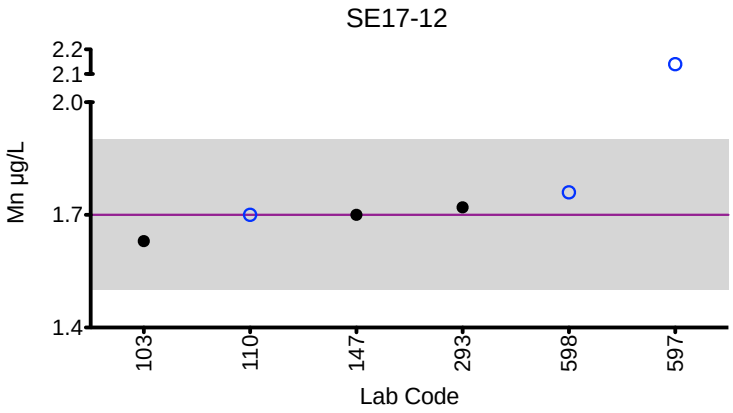
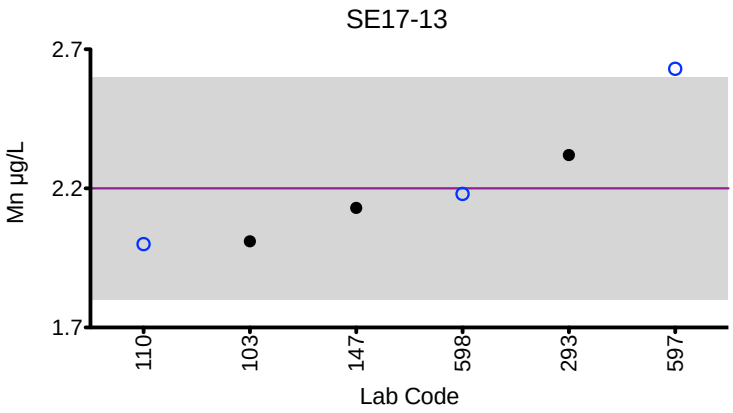
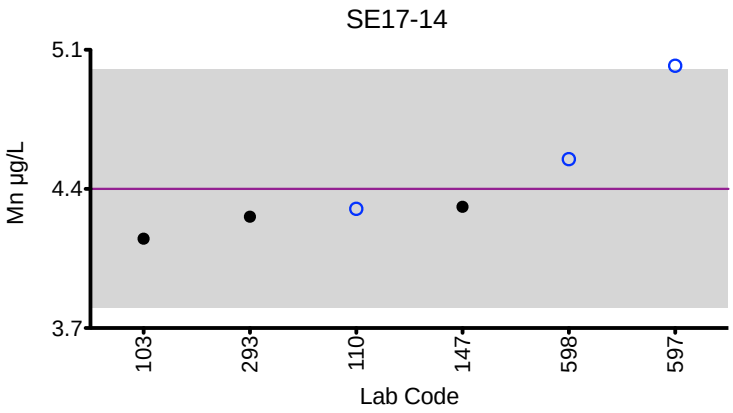
Results for Event #3, 2017: Summary Figures

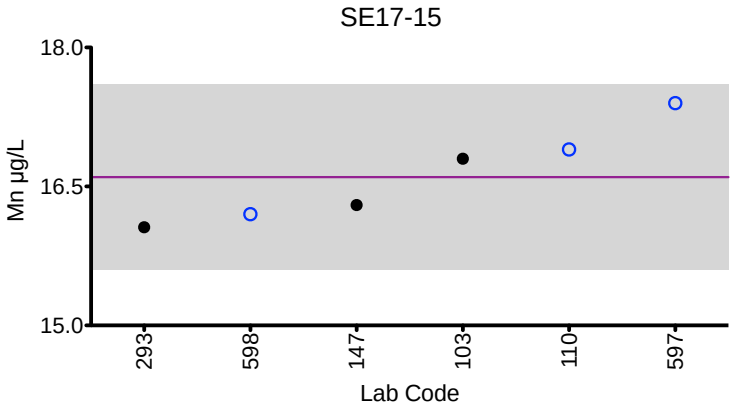
Serum Mn











Legend:
o C/HHEAR Labs ● Other Labs
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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Serum Mo (µg/L)

Lab Code	Method	SE17-11	SE17-12	SE17-13	SE17-14	SE17-15
103	DRC/CC-ICP-MS	5.07	2.86	6.64	1.19	3.41
110	ICP-MS	5.0	3.0	6.4	1.4	3.7
147	ICP-MS	5.11	3.00	6.33	1.19	3.44
293	ICP-MS	5.28	3.1	6.54	1.38	3.4
485	HR-ICP-MS	5.40	3.28	6.64	1.27	3.82
597	DRC/CC-ICP-MS	5.33	3.00	7.20	1.39	3.58
598	DRC/CC-ICP-MS	5.77	3.52	7.08	1.48	3.92

Summary Statistics

	SE17-11	SE17-12	SE17-13	SE17-14	SE17-15
Arithmetic Mean ($\bar{x}$)	5.28	3.11	6.69	1.33	3.61
Arithmetic SD (s)	0.26	0.22	0.33	0.11	0.21
Arithmetic RSD (%)	4.9	7.1	4.9	8.3	5.8
Number of Sample Measurements (N)	7	7	7	7	7

*Denotes a statistical Outlier.

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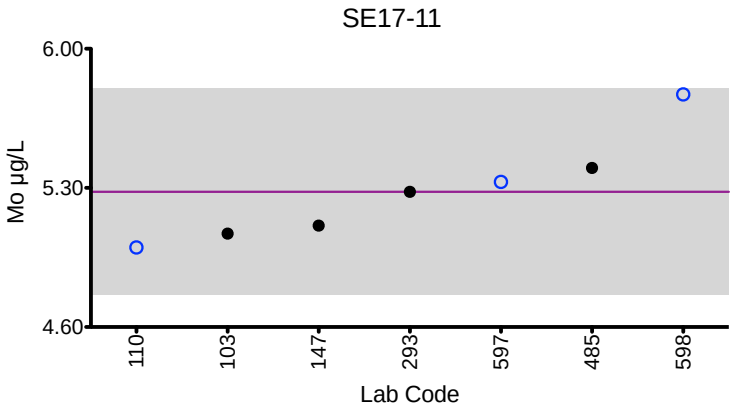
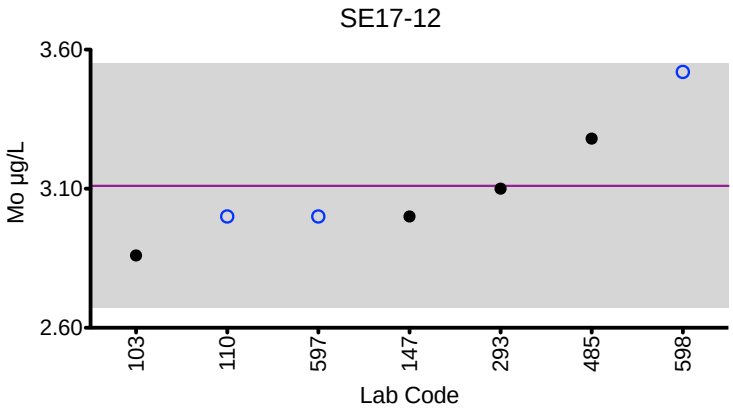
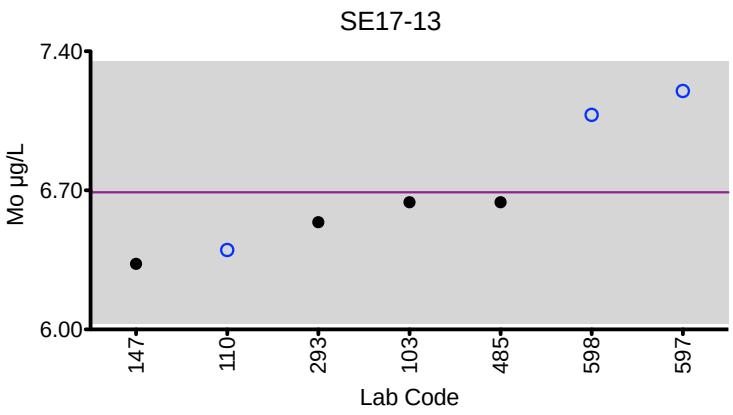
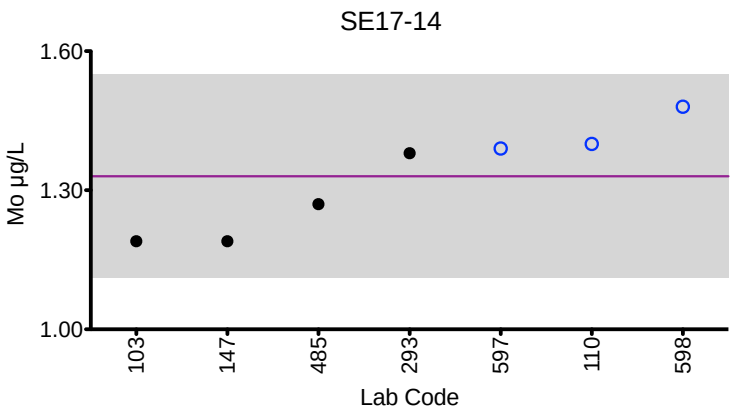
Results for Event #3, 2017: Summary Figures

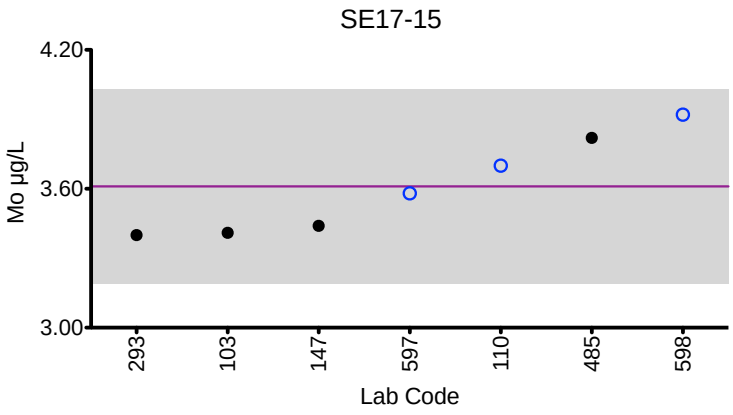
Serum Mo











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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Serum Ni (µg/L)

Lab Code	Method	SE17-11	SE17-12	SE17-13	SE17-14	SE17-15
110	DRC/CC-ICP-MS	5.4	8.5	2.5	11.8	5.6
147	ICP-MS	5.55	8.69	2.60	10.7	4.97
293	ICP-MS	4.86	7.34	2.04	10.2	4.34
485	HR-ICP-MS	5.12	8.91	2.17	10.9	4.96
597	DRC/CC-ICP-MS	4.88	8.42	1.71	11.8	4.48
598	ICP-MS	*7.87	*11.9	*5.92	*14.9	*7.54
599	DRC/CC-ICP-MS	*10.0	*16.2	*4.37	*21.7	*7.85

Summary Statistics

	SE17-11	SE17-12	SE17-13	SE17-14	SE17-15
Arithmetic Mean ($\bar{x}$)	5.2	8.4	2.2	11.1	4.9
Arithmetic SD (s)	0.3	0.6	0.4	0.7	0.5
Arithmetic RSD (%)	5.8	7.1	18.2	6.3	10.2
Number of Sample Measurements (N)	5	5	5	5	5

*Denotes a statistical Outlier.

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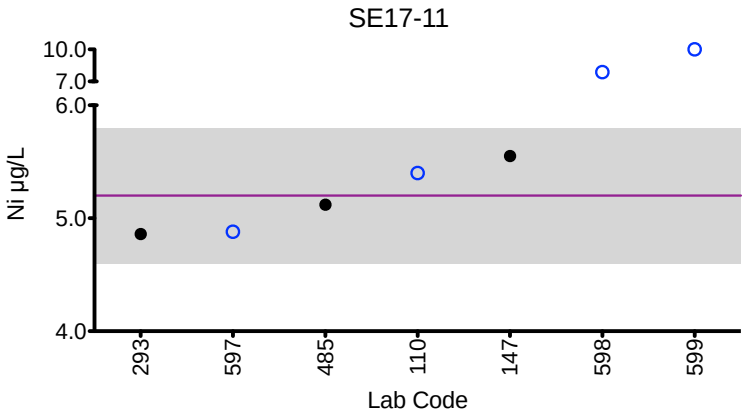
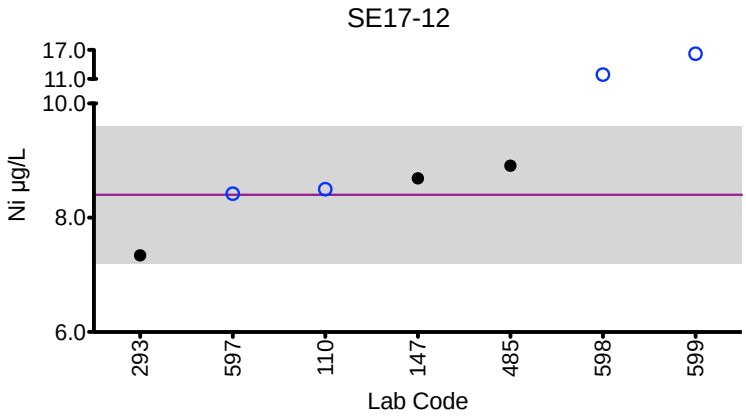
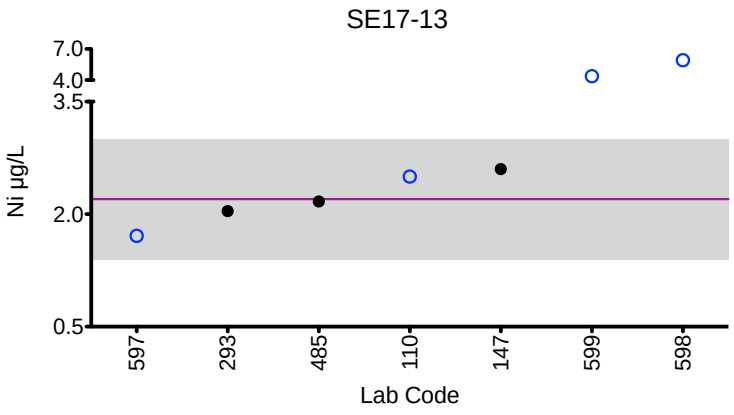
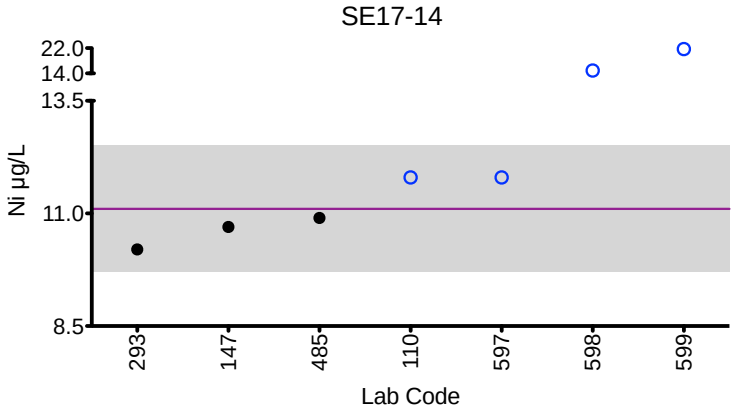
Results for Event #3, 2017: Summary Figures

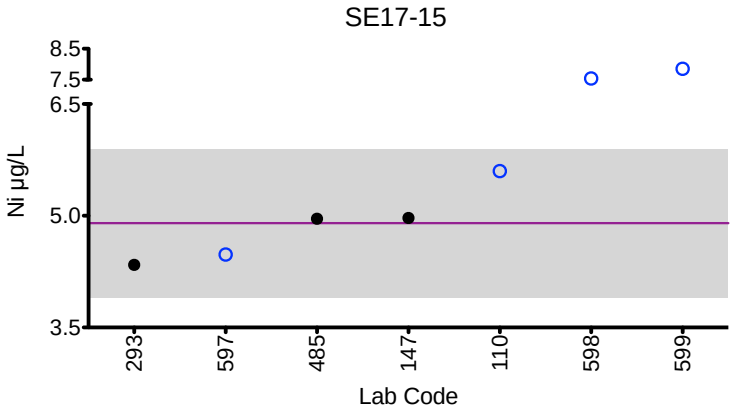
Serum Ni











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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Serum Pb (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
103	DRC/CC-ICP-MS	4.50	7.89	2.56	6.19	7.21
110	ICP-MS	4.5	8.0	2.6	6.1	7.5
147	ICP-MS	4.87	8.18	2.65	6.44	7.07
597	DRC/CC-ICP-MS	5.44	9.45	3.61	8.38	8.99
598	ICP-MS	4.07	7.17	2.26	5.52	6.00
Summary Statistics						
		SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Arithmetic Mean ($\bar{x}$)		4.7	8.1	2.7	6.5	7.4
Arithmetic SD (s)		0.5	0.8	0.5	1.1	1.1
Arithmetic RSD (%)		10.6	9.9	18.5	16.9	14.9
Number of Sample Measurements (N)		5	5	5	5	5

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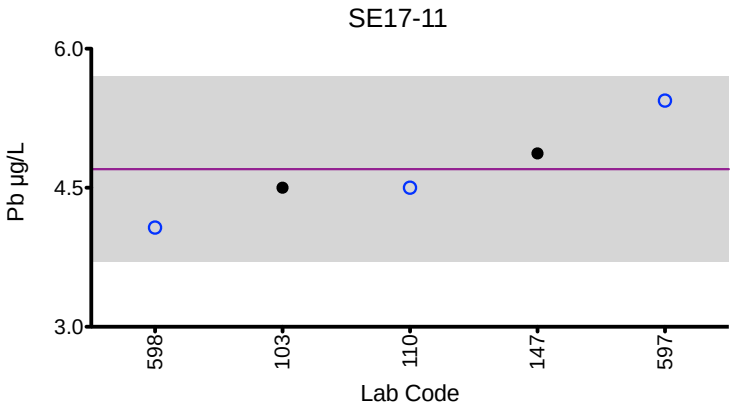
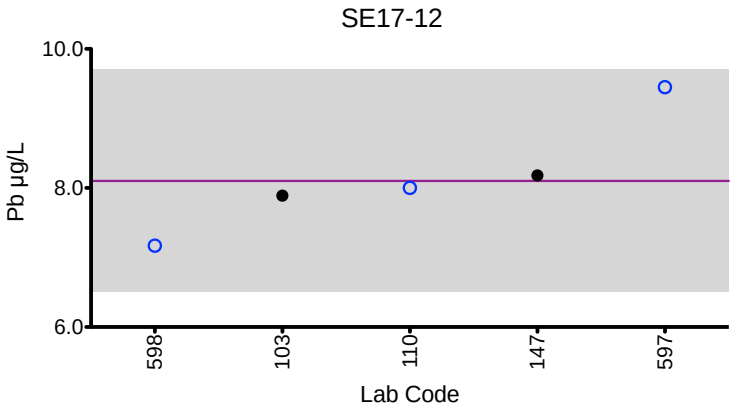
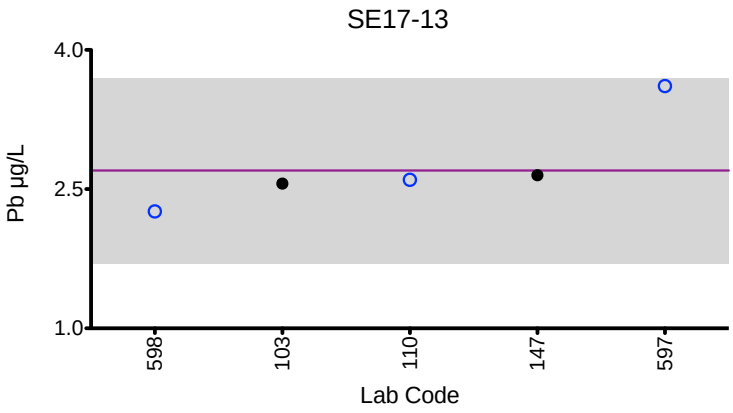
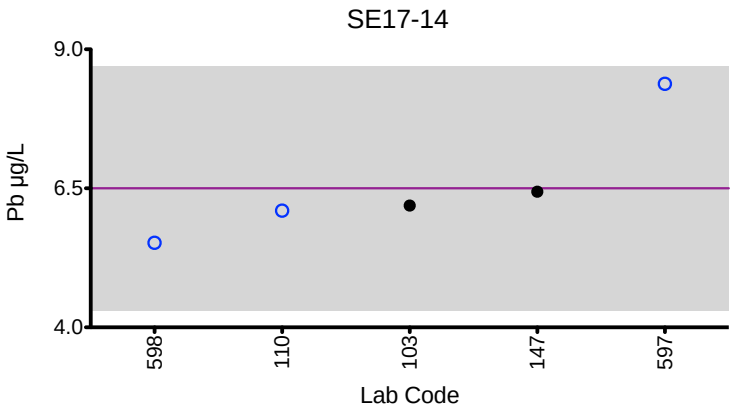
Results for Event #3, 2017: Summary Figures

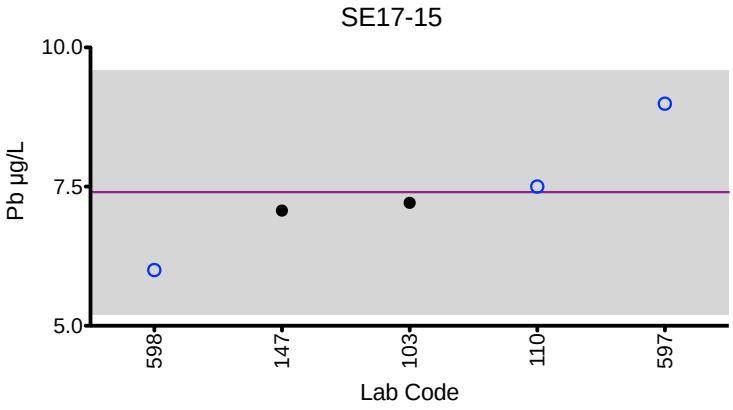
Serum Pb











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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Serum Sb (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
103	DRC/CC-ICP-MS	4.45	2.87	0.462	0.847	4.67
110	ICP-MS	4.30	2.65	0.45	0.83	4.36
147	ICP-MS	4.12	2.62	0.416	0.735	4.04
597	DRC/CC-ICP-MS	4.36	2.84	0.478	0.869	4.59
598	ICP-MS	*5.35	3.33	0.52	0.98	5.00
Summary Statistics						
		SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Arithmetic Mean ($\bar{x}$)		4.3	2.9	0.47	0.85	4.5
Arithmetic SD (s)		0.1	0.3	0.04	0.09	0.4
Arithmetic RSD (%)		2.3	10.3	8.5	10.6	8.9
Number of Sample Measurements (N)		4	5	5	5	5

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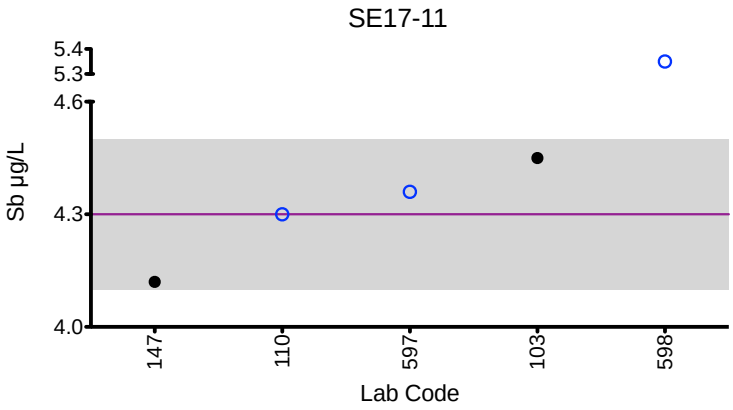
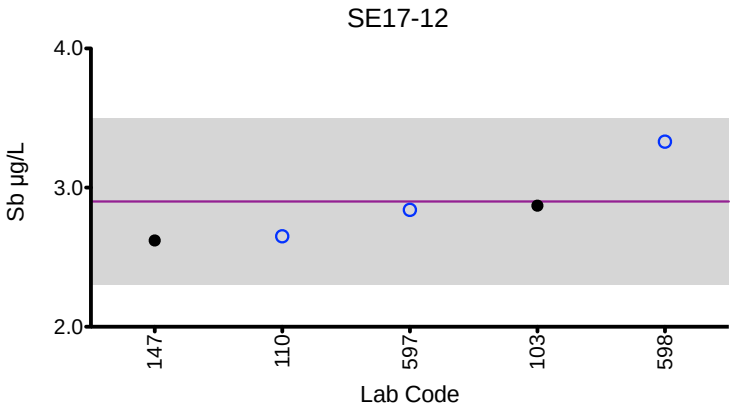
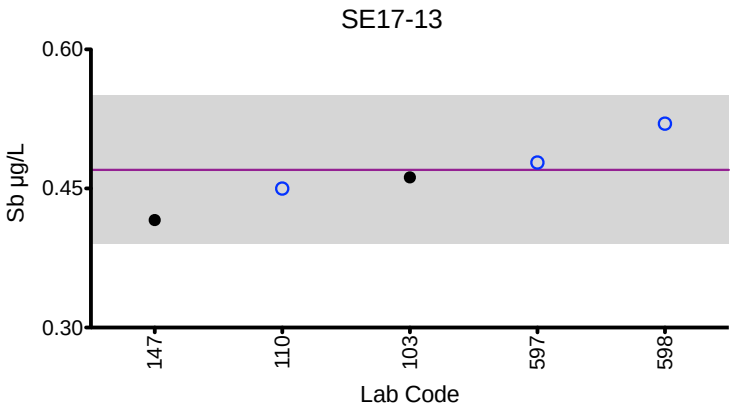
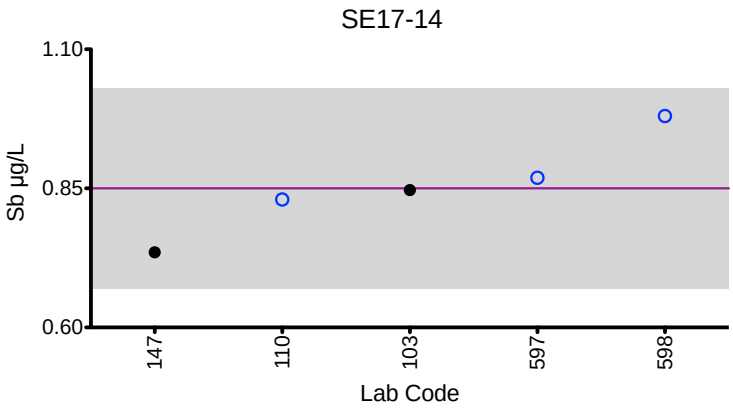
Results for Event #3, 2017: Summary Figures

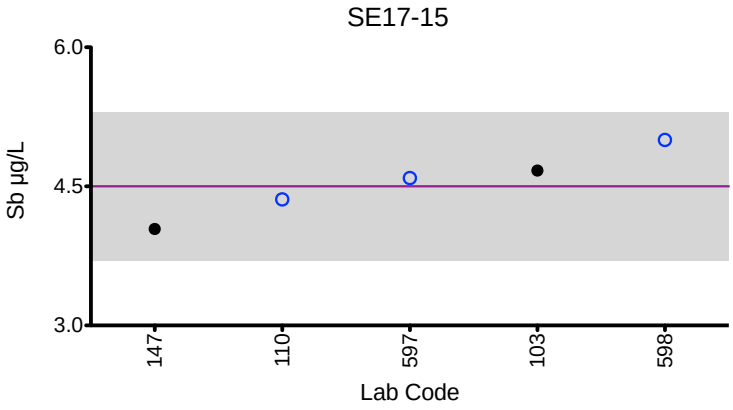
Serum Sb











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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Serum Tl (µg/L)

Lab Code	Method	SE17-11	SE17-12	SE17-13	SE17-14	SE17-15
103	DRC/CC-ICP-MS	5.15	1.60	3.77	2.79	2.09
110	ICP-MS	5.03	1.55	3.79	2.75	2.20
147	ICP-MS	5.05	1.48	3.68	2.64	2.01
597	DRC/CC-ICP-MS	5.07	1.65	4.08	3.07	2.25
598	ICP-MS	4.86	1.53	3.54	2.61	1.81

Summary Statistics

	SE17-11	SE17-12	SE17-13	SE17-14	SE17-15
Arithmetic Mean ($\bar{x}$)	5	1.6	3.8	2.8	2.1
Arithmetic SD (s)	0.1	0.1	0.2	0.2	0.2
Arithmetic RSD (%)	2	6.3	5.3	7.1	9.5
Number of Sample Measurements (N)	5	5	5	5	5

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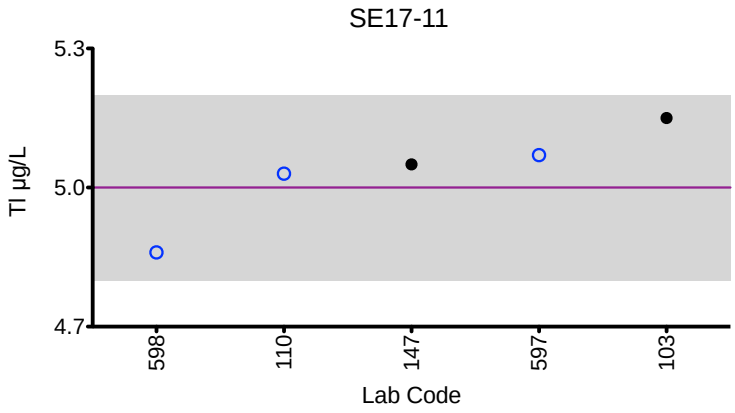
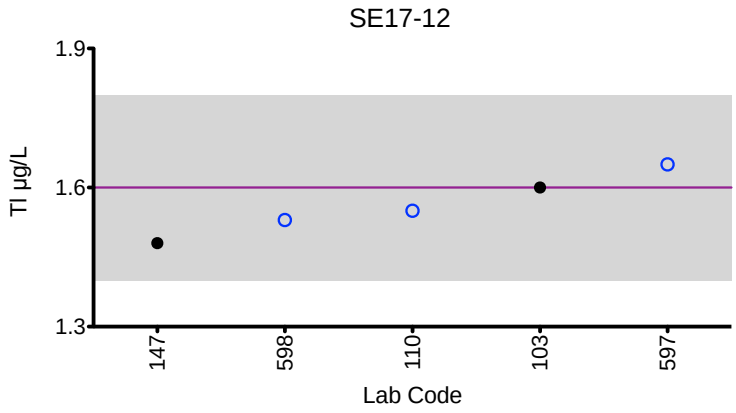
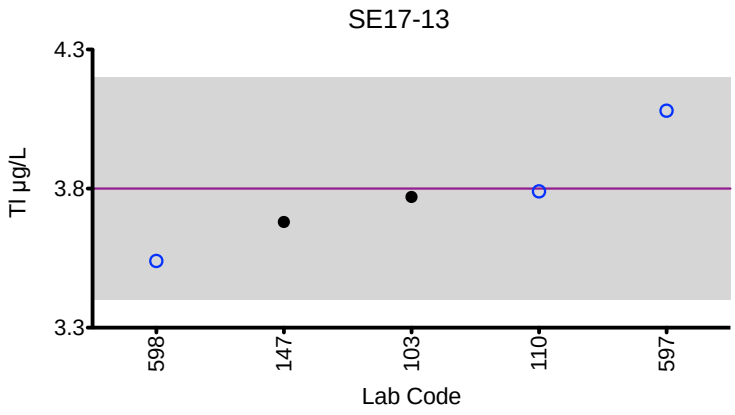
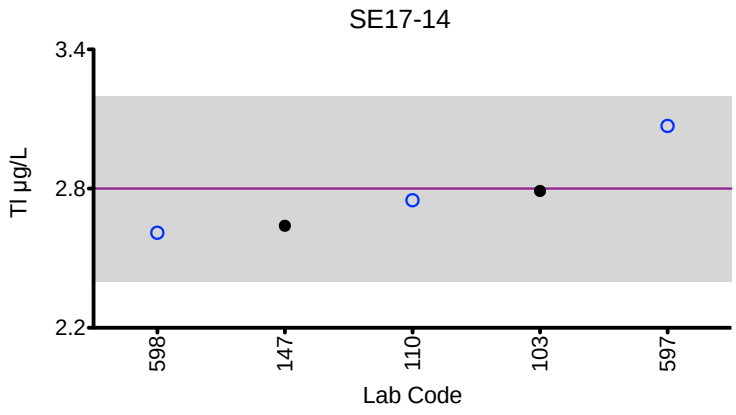
Results for Event #3, 2017: Summary Figures

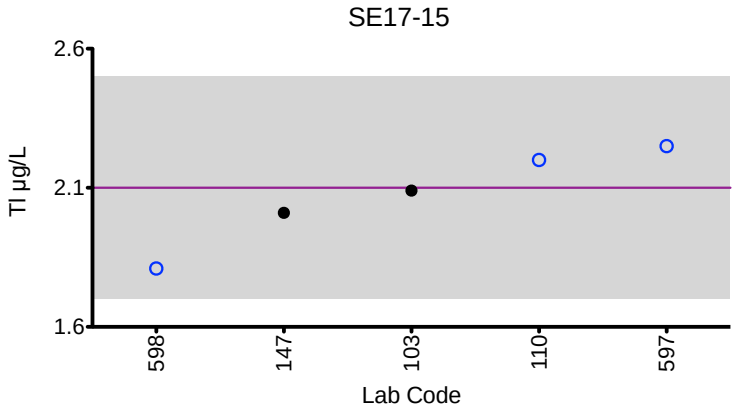
Serum Tl











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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Serum V (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
110	DRC/CC-ICP-MS	3.4	7.9	2.8	4.7	1.3
147	DRC/CC-ICP-MS	3.25	7.50	2.32	4.84	0.969
293	ICP-MS	3.56	7.79	2.56	5.26	1.1
485	HR-ICP-MS	3.37	8.00	2.36	4.99	1.00
597	DRC/CC-ICP-MS	3.31	7.86	2.65	5.50	1.15
598	DRC/CC-ICP-MS	3.68	8.17	2.55	5.47	1.16
Summary Statistics						
		SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Arithmetic Mean ($\bar{x}$)		3.4	7.9	2.5	5.1	1.1
Arithmetic SD (s)		0.2	0.2	0.2	0.3	0.1
Arithmetic RSD (%)		5.9	2.5	8	5.9	9.1
Number of Sample Measurements (N)		6	6	6	6	6

*Denotes a statistical Outlier.

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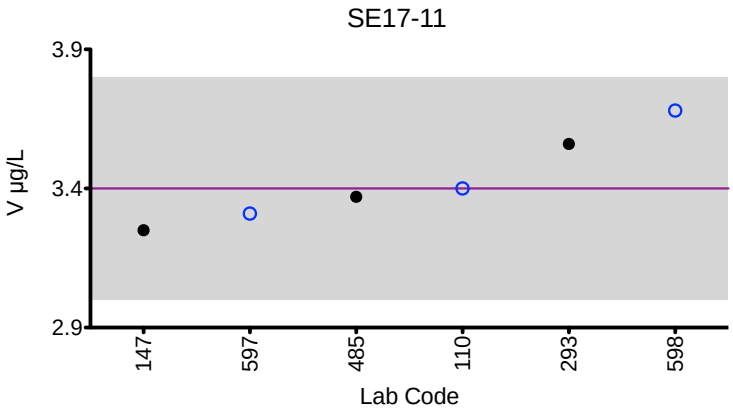
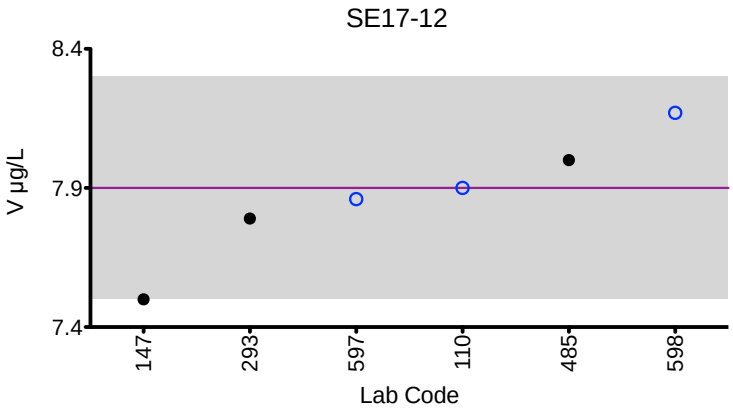
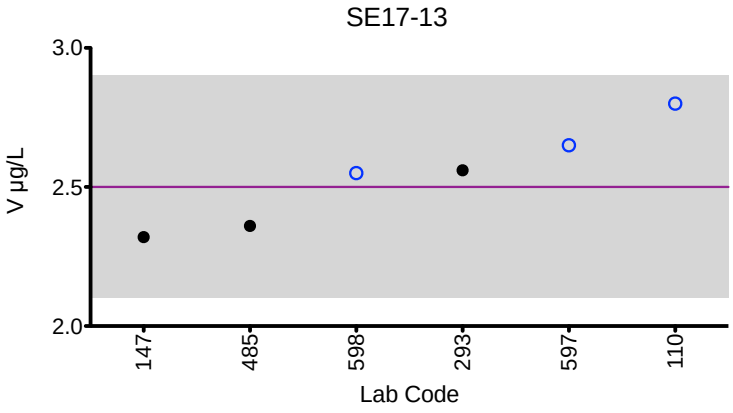
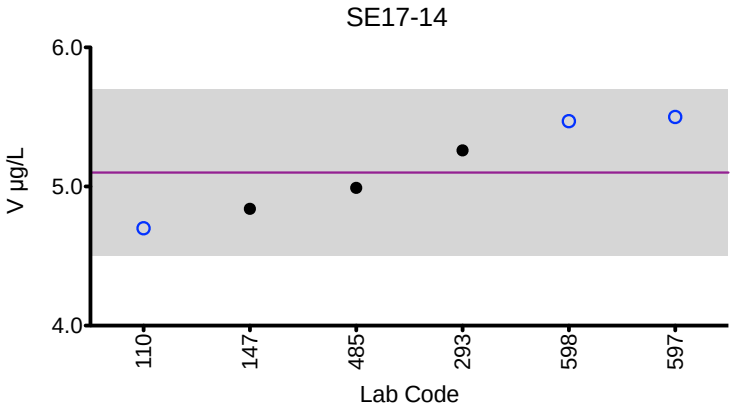
Results for Event #3, 2017: Summary Figures

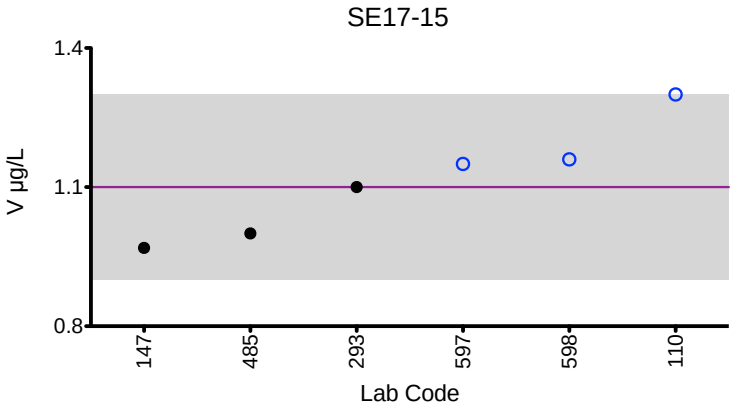
Serum V











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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Serum Ba (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
110	ICP-MS	2.7	2.7	0.7	0.7	0.6
147	ICP-MS	2.55	2.57	0.633	0.652	0.652
597	DRC/CC-ICP-MS	2.85	3.86	0.899	0.915	0.790
598	ICP-MS	2.53	2.39	0.46	0.63	0.69

Summary Statistics					
	SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Arithmetic Mean ($\bar{x}$)	2.7	2.9	0.67	0.72	0.68
Arithmetic SD (s)	0.1	0.7	0.18	0.13	0.08
Arithmetic RSD (%)	3.7	24.1	26.9	18.1	11.8
Number of Sample Measurements (N)	4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Serum Be (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
110	ICP-MS	3.11	3.95	5.24	0.12	0.65
147	ICP-MS	3.23	3.83	4.96	< 0.441	0.665
293	ICP-MS	3.4	4.18	5.45	0.15	0.65
598	ICP-MS	3.54	4.38	5.99	0.24	0.71

Summary Statistics					
	SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Arithmetic Mean ($\bar{x}$)	3.3	4.1	5.4	NA	0.67
Arithmetic SD (s)	0.2	0.2	0.4	NA	0.03
Arithmetic RSD (%)	6.1	4.9	7.4	NA	4.2
Number of Sample Measurements (N)	4	4	4	NA	4

*Denotes a statistical Outlier.

Statistics for SE17-14 were not calculated based on a lack of consensus among participating laboratories.

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Serum Cs (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
110	ICP-MS	0.7	0.7	0.5	0.4	0.4
597	DRC/CC-ICP-MS	0.786	0.822	0.640	0.502	0.547
598	ICP-MS	0.72	0.73	0.51	0.42	0.38
Summary Statistics						
		SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Arithmetic Mean ($\bar{x}$)		0.7	0.8	0.6	0.4	0.4
Arithmetic SD (s)		<0.1	0.1	0.1	0.1	0.1
Arithmetic RSD (%)		<0.1	12.5	16.7	25.0	25.0
Number of Sample Measurements (N)		3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Serum Hg (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
103	DRC/CC-ICP-MS	1.96	4.13	0.524	7.93	4.92
110	ICP-MS	2.0	4.0	0.5	7.5	4.7
147	ICP-MS	1.58	3.95	0.680	6.66	4.23
598	ICP-MS	2.12	4.67	0.85	8.85	5.43
Summary Statistics						
		SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Arithmetic Mean ($\bar{x}$)		1.9	4.2	0.6	7.7	4.8
Arithmetic SD (s)		0.2	0.3	0.2	0.9	0.5
Arithmetic RSD (%)		10.5	7.1	33.3	11.7	10.4
Number of Sample Measurements (N)		4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Serum Pt (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
110	ICP-MS	0.5	2.1	0.2	1.4	0.1
598	ICP-MS	0.46	2.26	0.23	1.50	0.11
Summary Statistics						
		SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Arithmetic Mean ($\bar{x}$)		0.48	2.2	0.22	1.5	0.11
Arithmetic SD (s)		0.03	0.1	0.02	0.1	0.01
Arithmetic RSD (%)		6.3	4.5	9.1	6.7	9.1
Number of Sample Measurements (N)		2	2	2	2	2

*Denotes a statistical Outlier.

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Serum Sn (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
110	ICP-MS	5.6	3.1	8.1	1.0	5.7
147	ICP-MS	5.33	3.03	7.89	0.887	5.40
597	DRC/CC-ICP-MS	5.86	3.45	9.00	1.22	6.27
598	ICP-MS	6.26	3.52	8.66	1.11	6.41
Summary Statistics						
		SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Arithmetic Mean ($\bar{x}$)		5.8	3.3	8.4	1.1	5.9
Arithmetic SD (s)		0.4	0.2	0.5	0.1	0.5
Arithmetic RSD (%)		6.9	6.1	6.0	9.1	8.5
Number of Sample Measurements (N)		4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Serum Sr (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
103	DRC/CC-ICP-MS	133	68.1	25.0	56.8	87.5
200	ICP-MS	131.4	70.1	24.5	51.7	90.2
Summary Statistics						
		SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Arithmetic Mean ($\bar{x}$)		132	69.1	24.8	54.3	88.9
Arithmetic SD (s)		1	1.4	0.4	3.6	1.9
Arithmetic RSD (%)		0.8	2.0	1.6	6.6	2.1
Number of Sample Measurements (N)		2	2	2	2	2

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Serum Ti (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
200	DRC/CC-ICP-MS	8.4	5.5	4.3	1.1	10.8
485	HR-ICP-MS	12.4	5.28	5.70	1.09	14.9
Summary Statistics						
		SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Arithmetic Mean ($\bar{x}$)		10	5.4	5	1.1	13
Arithmetic SD (s)		3	0.2	1	<0.1	3
Arithmetic RSD (%)		30.0	3.7	20.0	<0.1	23.1
Number of Sample Measurements (N)		2	2	2	2	2

*Denotes a statistical Outlier.

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Serum U (µg/L)

Lab Code	Method	SE17-11	SE17-12	SE17-13	SE17-14	SE17-15
103	DRC/CC-ICP-MS	0.0967	0.0673	0.161	0.0259	0.00876
110	ICP-MS	0.106	0.074	0.165	0.030	0.009
147	ICP-MS	0.114	0.0702	0.151	0.0286	< 0.0145
598	ICP-MS	0.15	*0.12	0.20	*0.07	*0.04

Summary Statistics

	SE17-11	SE17-12	SE17-13	SE17-14	SE17-15
Arithmetic Mean ($\bar{x}$)	0.12	0.071	0.17	0.028	0.0089
Arithmetic SD (s)	0.02	0.003	0.02	0.002	0.0002
Arithmetic RSD (%)	16.7	4.2	11.8	7.1	2.2
Number of Sample Measurements (N)	4	3	4	3	2

*Denotes a statistical Outlier.

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Results for Event #3, 2017:
Laboratory Data and Summary Statistics

Serum W (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
110	ICP-MS	3.05	4.36	2.43	1.32	0.5
147	ICP-MS	2.94	4.34	2.37	1.26	0.476
200	ICP-MS	2.78	4.63	2.43	1.16	0.51
598	ICP-MS	3.68	5.33	2.85	1.55	0.60
Summary Statistics						
		SE17-11	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
Arithmetic Mean ($\bar{x}$)		3.1	4.7	2.5	1.3	0.5
Arithmetic SD (s)		0.4	0.5	0.2	0.2	0.1
Arithmetic RSD (%)		12.9	10.6	8.0	15.4	20.0
Number of Sample Measurements (N)		4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #3, 2017: Additional Elements in Serum

Serum Ag (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
147	ICP-MS	< 0.248	< 0.248	< 0.248	< 0.248	< 0.248

Serum B (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
200	ICP-MS	41.0	45.4	33.5	34.6	34.6

Serum Bi (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
147	ICP-MS	0.028	< 0.201	< 0.201	< 0.201	< 0.0201

Serum Fe (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
457	ICP-AES/OES	633.0	648	1119	704	734

Serum I (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
147	ICP-MS	55.4	55.8	61.6	54.1	53.7

Serum Li (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
147	ICP-MS	1.20	1.12	0.439	0.694	0.675

Serum Mg (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
457	ICP-AES/OES	1520	1552	1590	1716	101
597	DRC/CC-ICP-MS	20200	21000	23300	25200	23600

Serum Te (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
147	ICP-MS	< 0.0880	< 0.0880	< 0.0880	< 0.0880	< 0.0880

Serum Th (µg/L)						
Lab Code	**Method**	**SE17-11**	**SE17-12**	**SE17-13**	**SE17-14**	**SE17-15**
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.

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