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New York State Biomonitoring Program for Trace Elements

Event #1, 2022

Trace Elements in Whole Blood, Urine, and Serum

April, 2022

Wadsworth Center
NEW YORK STATE DEPARTMENT OF HEALTH
Trace Elements Laboratory

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Event #1, 2022:
Trace Elements in Whole Blood, Urine, and Serum

4/18/2022

Dear Laboratory Director,

This report summarizes performance for the first biomonitoring proficiency test (PT) event of 2022 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 #2, 2022) will be shipped May 18, 2022. Comments about this report may be directed to trel@health.ny.gov.

Sincerely,

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

Kayla Mehigan
Coordinator, Biomonitoring PT Program,
Division of Environmental Sciences
Wadsworth Center

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Event #1, 2022

Trace Elements in Whole Blood

Wadsworth Center
NEW YORK STATE DEPARTMENT OF HEALTH
Trace Elements Laboratory

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Event #1, 2022:
Trace Elements in Whole Blood

PT Materials

Human whole blood was purchased from Zen-Bio, 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 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

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) if a robust mean is not possible, the arithmetic mean after outlier deletion.

Additional Elements

An additional 25 elements were reported by at least one participant: Ag, Al, Ba, Be, Bi, 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 #1, 2022: Summary Statistics

Whole Blood As (µg/L)					
	BE22-01	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
Target (Arithmetic Mean ($\bar{x}$))	12.1	37.9	16.3	1.96	8.99
Upper Limit	18.1	45.5	22.3	7.96	14.99
Lower Limit	6.1	30.3	10.3	0.00	2.99
Arithmetic SD (s)	0.7	2.3	1.0	0.23	0.41
Arithmetic RSD (%)	6.0	6.2	6.1	12	4.5
Number of Sample Measurements (N)	7	7	7	7	7

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 #1, 2022:
Performance of Participating Laboratories

Whole Blood As (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
	Target	**12.1**	**37.9**	**16.3**	**1.96**	**8.99**
103	ICP-MS/MS	12.5	38.7	16.8	1.84	8.99
110	DRC/CC-ICP-MS	12.4	39.3	16.9	2.12	9.49
147	ICP-MS	11.90	37.1	16.4	1.55	8.35
264	ICP-MS	11.22	36.34	15.61	2.13	8.93
293	DRC/CC-ICP-MS	13.18	41.7	17.68	1.94	9.5
391	DRC/CC-ICP-MS	*7.28	*11.0 ↓	*6.15 ↓	*4.14	*4.73
597	ICP-MS/MS	12.4	37.5	16.4	2.24	8.93
598	DRC/CC-ICP-MS	11.20	34.4	14.60	1.88	8.7

Based on the grading criteria for As in Whole Blood, 95% of results were satisfactory, with 1 of the 8 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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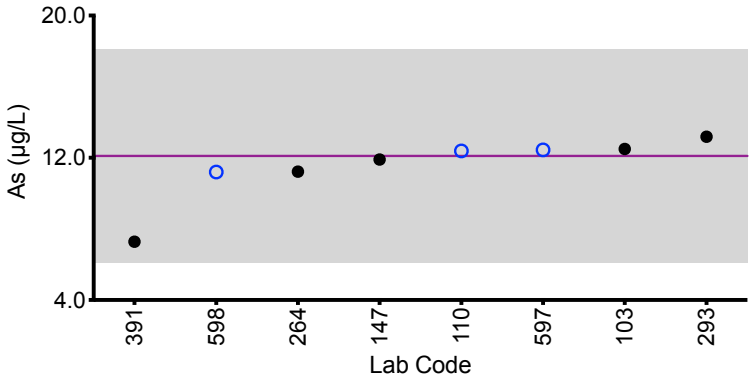
Results for Event #1, 2022: Summary Figures

Whole Blood As

BE22-01



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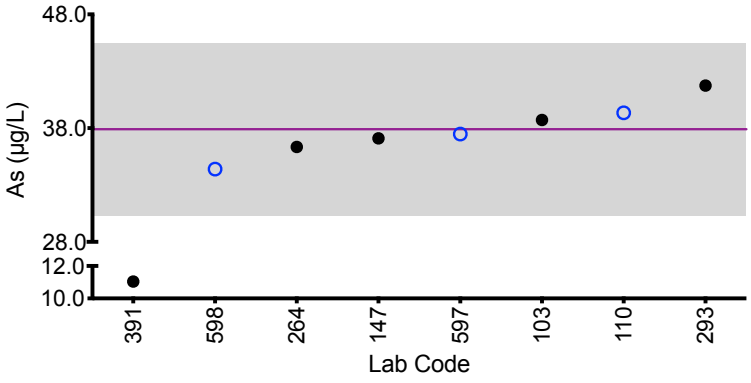

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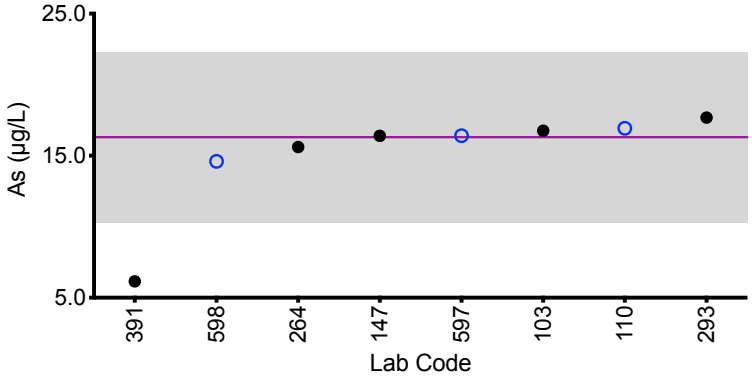
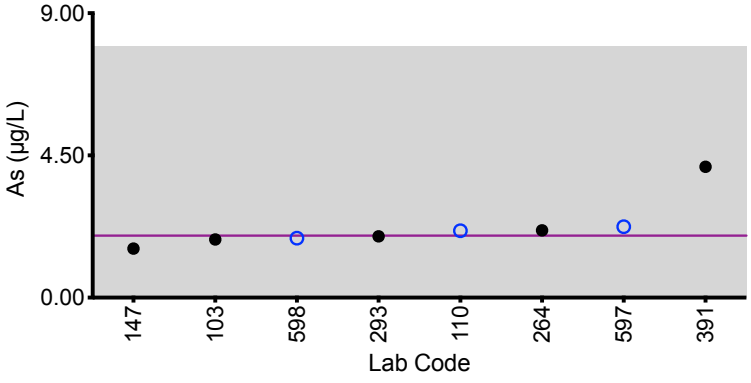


BE22-04



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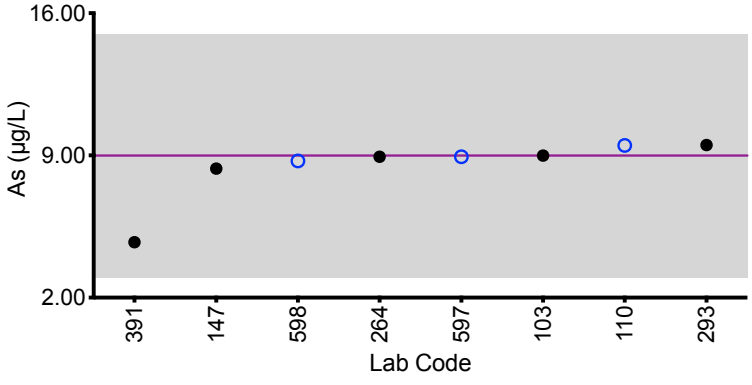

Legend:

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 #1, 2022: Summary Statistics

Whole Blood Cd (µg/L)					
	BE22-01	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
Target (Robust Mean (x*))	9.5	12.0	4.0	1.87	0.54
Upper Limit	10.9	13.8	5.0	2.87	1.54
Lower Limit	8.1	10.2	3.0	0.87	0.00
Robust SD (s*)	0.3	0.6	0.3	0.16	0.05
Robust RSD (%)	3.4	5.0	7.5	8.6	9.3
Number of Sample Measurements (N)	13	13	13	13	11
Standard Uncertainty (*u*)	0.1	0.2	0.1	0.06	0.02

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 #1, 2022:
Performance of Participating Laboratories

Whole Blood Cd (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
	Target	**9.5**	**12.0**	**4.0**	**1.87**	**0.54**
103	ICP-MS/MS	9.76	12.2	4.11	1.80	0.527
107	ICP-MS/MS	9.614	12.442	3.983	1.898	0.541
110	ICP-MS	9.69	12.1	4.12	1.83	0.55
116	ICP-MS/MS	9.49	11.8	4.08	1.96	<1.50
147	ICP-MS	9.80	12.5	4.21	1.82	0.577
264	ICP-MS	8.26	10.26	3.50	1.72	0.57
293	DRC/CC-ICP-MS	9.61	11.82	3.880	1.8	0.53
391	DRC/CC-ICP-MS	8.39	12.3	2.74 ↓	0.911	0.012
597	ICP-MS/MS	9.31	11.4	3.80	1.69	0.510
598	DRC/CC-ICP-MS	9.40	9.60 ↓	3.720	2.1	0.35
605	ICP-MS	11.3 ↑	13.1	4.37	2.05	<0.5
606	ICP-MS/MS	9.49	12.0	4.12	1.91	0.715
686	ICP-MS	9.26	12.6	4.47	2.07	0.660

Based on the grading criteria for Cd in Whole Blood, 95% of results were satisfactory, with 0 of the 13 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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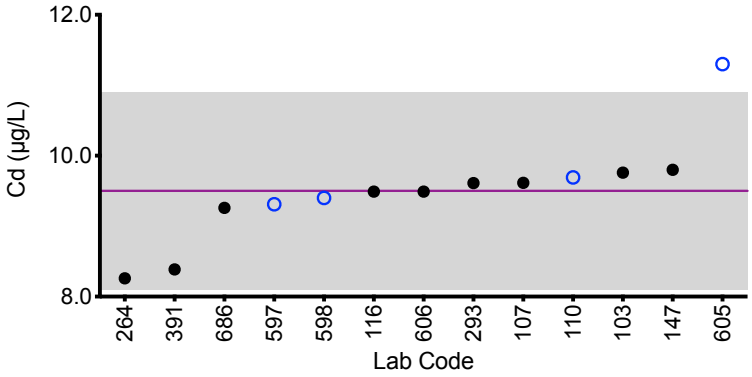
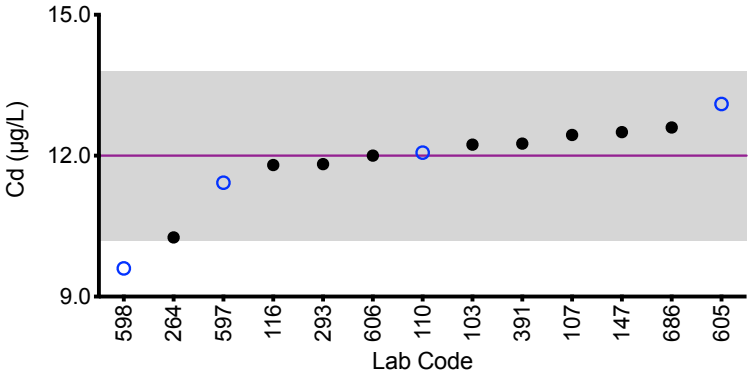
Results for Event #1, 2022: Summary Figures

Whole Blood Cd

BE22-01



BE22-02



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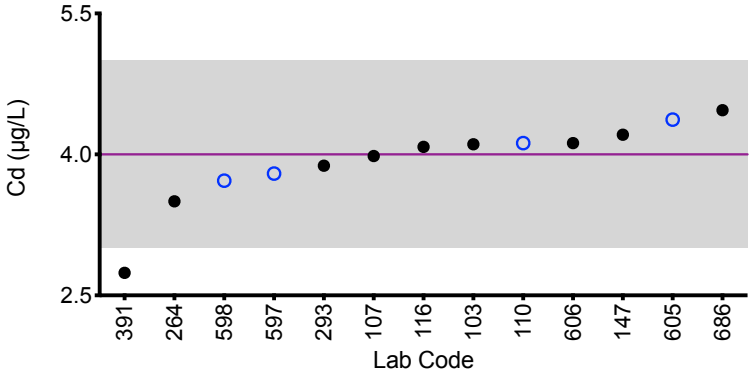
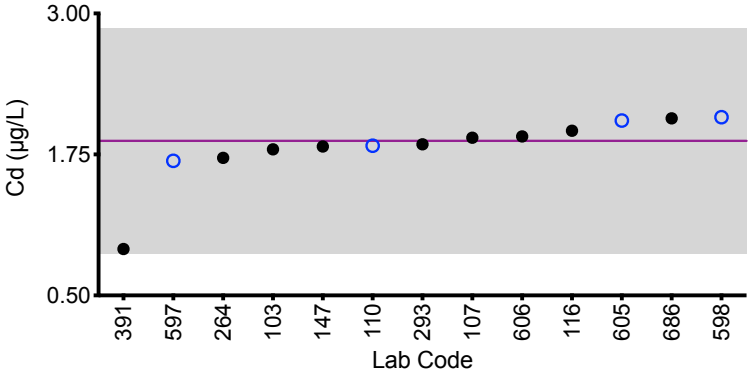
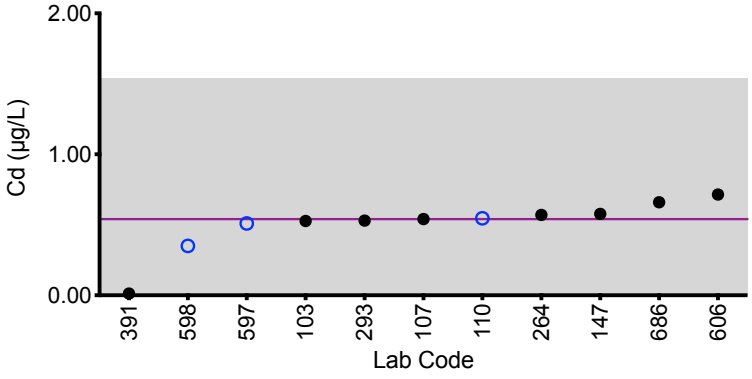


BE22-04



BE22-05



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 #1, 2022: Summary Statistics

Whole Blood Co (µg/L)					
	BE22-01	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
Target (Arithmetic Mean ($\bar{x}$))	213	1.18	79	6.1	5.05
Upper Limit	256	2.68	95	7.6	6.55
Lower Limit	170	0.00	63	4.6	3.55
Arithmetic SD (s)	9	0.10	4	0.4	0.21
Arithmetic RSD (%)	4.2	8.5	5.1	6.6	4.2
Number of Sample Measurements (N)	8	8	8	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 #1, 2022:
Performance of Participating Laboratories

Whole Blood Co (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
	Target	**213**	**1.18**	**79**	**6.1**	**5.05**
103	ICP-MS/MS	216	1.13	80.7	5.96	4.94
110	ICP-MS	223	1.24	82.3	6.39	5.24
147	ICP-MS	223	1.30	84.9	6.31	5.16
255	ICP-MS	210	1.1	79	6.1	4.9
264	ICP-MS	195.81	0.99	73.03	5.72	4.79
293	DRC/CC-ICP-MS	213.65	1.29	80.25	7.00	4.99
391	DRC/CC-ICP-MS	*137 ↓	*2.61	*56.3 ↓	*8.34 ↑	5.42
597	ICP-MS/MS	211	1.21	78.4	5.97	4.99
598	ICP-MS	209.00	1.18	72.50	5.67	*4.19

Based on the grading criteria for Co in Whole Blood, 93% of results were satisfactory, with 1 of the 9 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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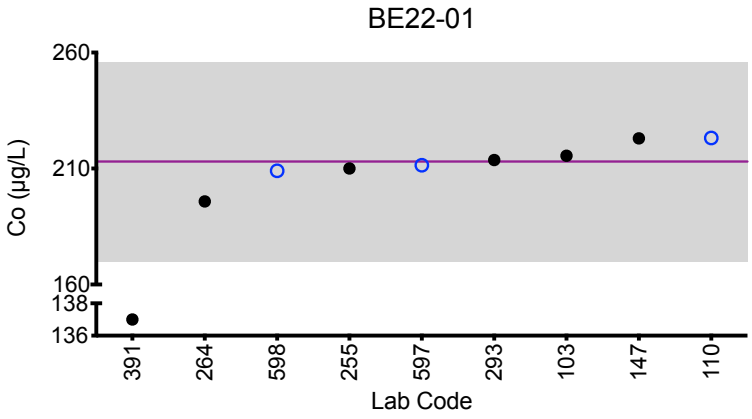
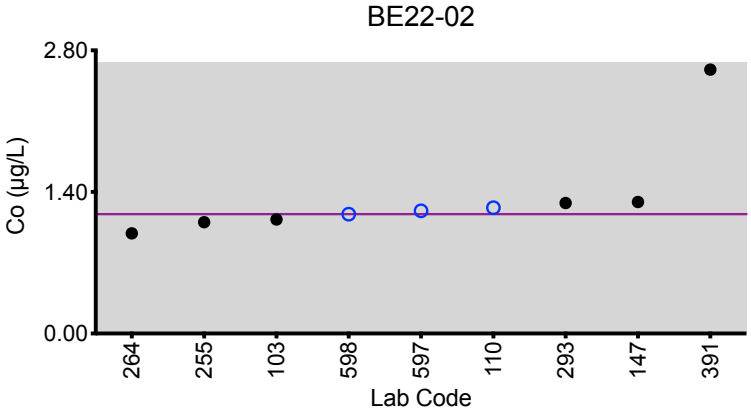
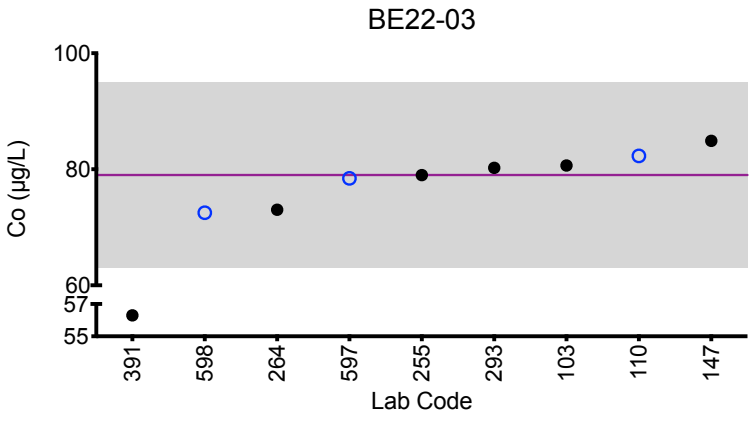
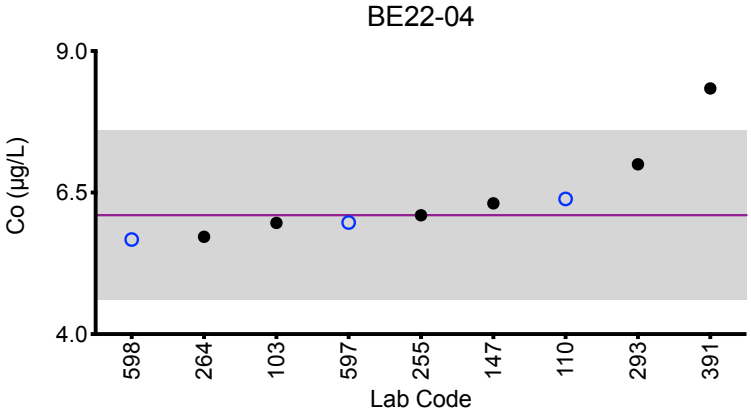
Results for Event #1, 2022: Summary Figures

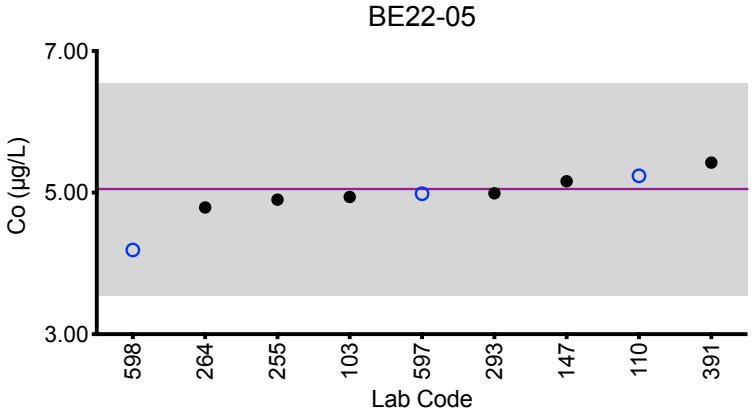
Whole Blood Co











Legend:

o C/HHEAR Labs ● Other Labs

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

Gray area = acceptable range based on quality specifications:

±1.5 µg/L or ±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 #1, 2022: Summary Statistics

Whole Blood Cr (µg/L)					
	BE22-01	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
Target (Arithmetic Mean ($\bar{x}$))	5.7	3.7	1.0	15.3	2.00
Upper Limit	7.7	5.7	3.0	18.4	4.00
Lower Limit	3.7	1.7	0.0	12.2	0.00
Arithmetic SD (s)	0.3	0.3	0.3	1.3	0.23
Arithmetic RSD (%)	5.8	7.8	28	8.5	12
Number of Sample Measurements (N)	8	8	5	9	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 #1, 2022:
Performance of Participating Laboratories

Whole Blood Cr (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
	Target	**5.7**	**3.7**	**1.0**	**15.3**	**2.00**
103	ICP-MS/MS	5.19	3.54	<1.50	14.1	1.62
110	DRC/CC-ICP-MS	5.96	3.64	0.59	17.0	2.06
147	DRC/CC-ICP-MS	6.26	4.26	1.19	16.8	2.34
255	ICP-MS	5.7	3.6	<1.0	15	1.9
264	ICP-MS	5.75	3.49	0.91	15.26	1.87
293	DRC/CC-ICP-MS	5.78	3.87	1.24	14.95	2.27
391	DRC/CC-ICP-MS	*10.5 ↑	*11.4 ↑	*8.93 ↑	16.4	*9.68 ↑
597	ICP-MS/MS	5.35	3.91	<0.957	14.6	1.95
598	DRC/CC-ICP-MS	5.74	3.36	1.27	13.30	1.99

Based on the grading criteria for Cr in Whole Blood, 91% of results were satisfactory, with 1 of the 9 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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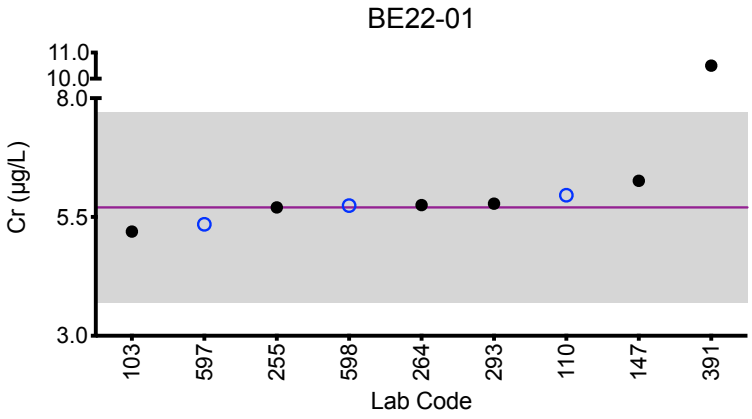
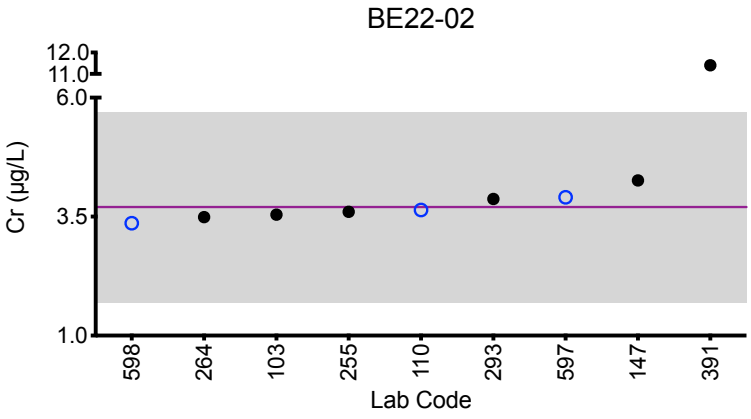
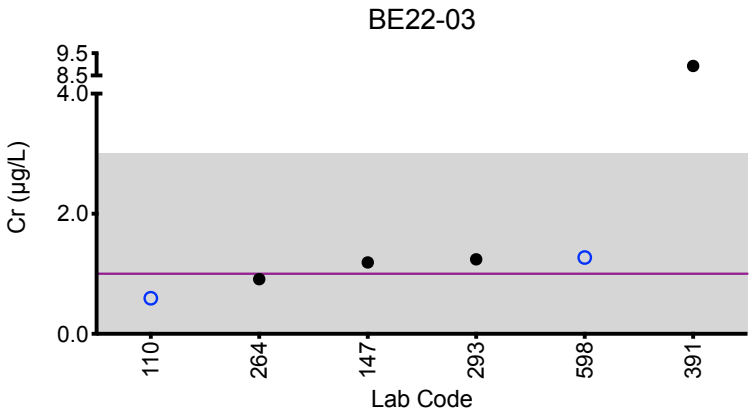
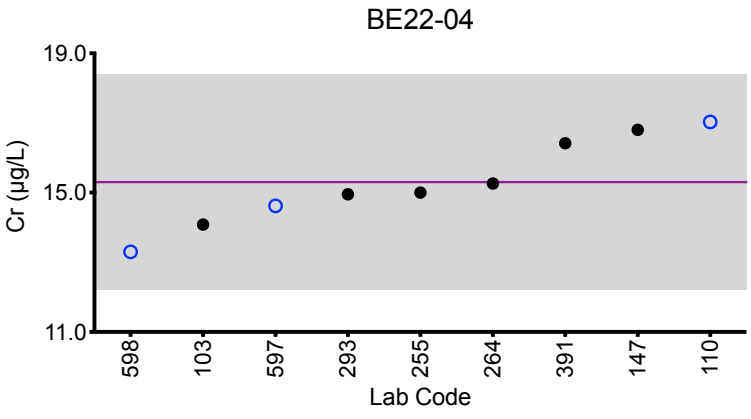
Results for Event #1, 2022: Summary Figures

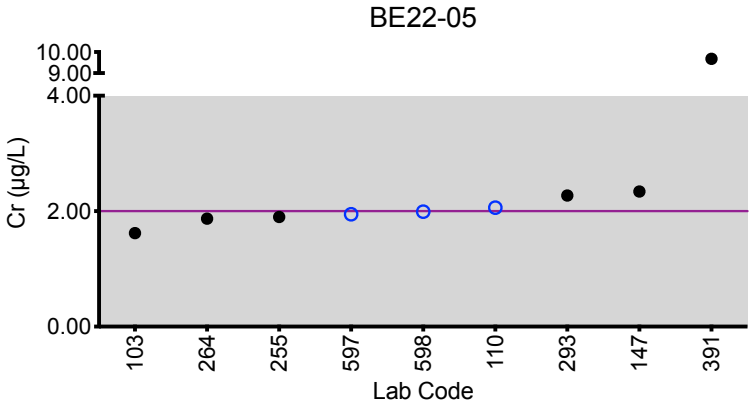
Whole Blood Cr











Legend:

o C/HHEAR Labs ● Other Labs

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

Gray area = acceptable range based on quality specifications:

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

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Results for Event #1, 2022: Summary Statistics

Whole Blood Hg (µg/L)					
	BE22-01	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
Target (Robust Mean (x*))	18.2	7.2	25.0	5.1	0.95
Upper Limit	23.7	10.2	32.5	8.1	3.95
Lower Limit	12.7	4.2	17.5	2.1	0.00
Robust SD (s*)	1.6	0.5	1.3	0.4	0.16
Robust RSD (%)	8.8	6.9	5.2	6.8	17
Number of Sample Measurements (N)	13	13	13	13	12
Standard Uncertainty (*u*)	0.6	0.2	0.5	0.1	0.06

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 #1, 2022:
Performance of Participating Laboratories

Whole Blood Hg (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
	Target	**18.2**	**7.2**	**25.0**	**5.1**	**0.95**
103	ICP-MS/MS	18.7	7.62	26.1	5.40	1.12
107	ICP-MS/MS	18.29	7.52	25.53	5.38	0.99
110	ICP-MS	18.0	7.26	25.0	5.12	0.92
116	ICP-MS/MS	18.9	6.82	25.4	5.16	<1.50
147	ICP-MS	18.4	7.16	26.3	5.06	0.554
264	ICP-MS	17.25	7.61	24.18	5.37	1.40
293	DRC/CC-ICP-MS	14.6	5.87	19.7	4.31	0.80
391	CV-AAS	20.8	8.55	23.9	7.29	2.30
597	ICP-MS/MS	17.1	6.68	23.4	4.92	0.976
598	ICP-MS	16.0	5.32	20.2	3.82	0.80
605	ICP-MS	20.2	7.5	26.8	5.31	0.948
606	ICP-MS/MS	17.8	7.26	25.6	4.89	0.900
686	ICP-MS	19.4	7.11	25.6	4.99	0.867

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

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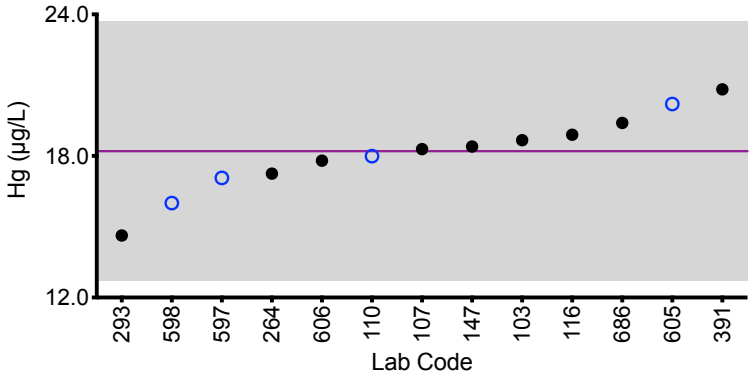
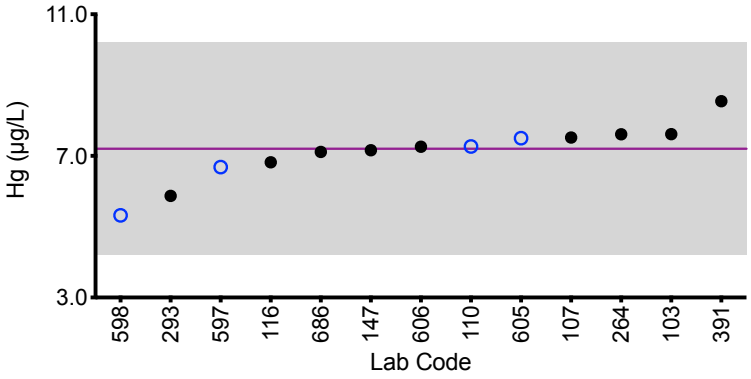
Results for Event #1, 2022: Summary Figures

Whole Blood Hg

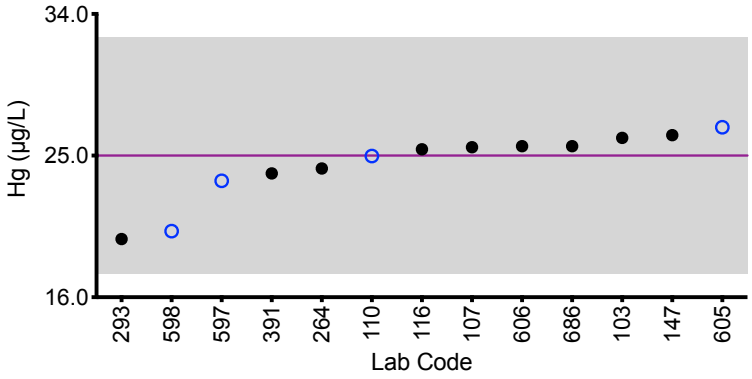
BE22-01



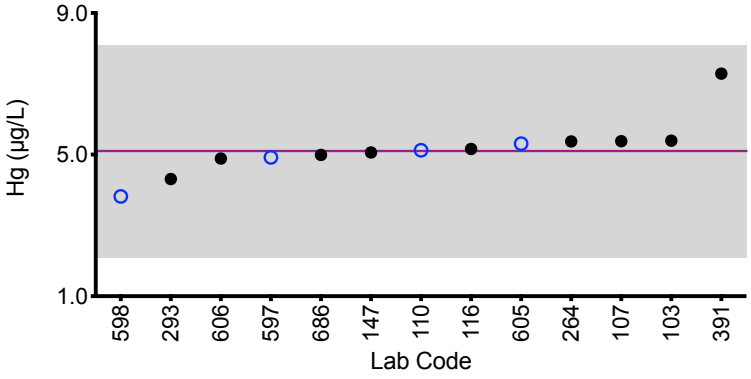
BE22-02



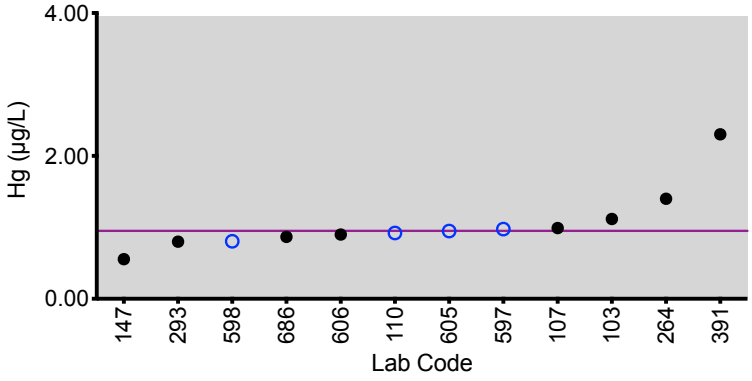
BE22-03



BE22-04



BE22-05



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 #1, 2022: Summary Statistics

Whole Blood Mn (µg/L)					
	BE22-01	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
Target (Robust Mean (x*))	10.1	13.2	33.7	23.0	15.0
Upper Limit	13.1	16.2	39.4	26.9	18.0
Lower Limit	7.1	10.2	28.0	19.1	12.0
Robust SD (s*)	0.8	1.0	1.7	1.3	1.0
Robust RSD (%)	7.9	7.6	5.0	5.7	6.7
Number of Sample Measurements (N)	10	10	10	10	10
Standard Uncertainty (*u*)	0.3	0.4	0.7	0.5	0.4

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 Laboratory Medicine 2016; 54(12): 1921-1928).

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Results for Event #1, 2022:
Performance of Participating Laboratories

Whole Blood Mn (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
	Target	**10.1**	**13.2**	**33.7**	**23.0**	**15.0**
103	ICP-MS/MS	10.5	13.4	34.1	22.5	15.3
107	ICP-MS/MS	10.39	13.61	33.41	23.90	15.61
110	ICP-MS	10.1	12.7	34.9	22.8	14.7
147	ICP-MS	12.0	14.8	35.6	24.2	17.1
264	ICP-MS	15.39 ↑	18.58 ↑	39.74 ↑	27.58 ↑	20.80 ↑
293	DRC/CC-ICP-MS	9.1	11.15	33.1	21.5	13.45
391	DRC/CC-ICP-MS	8.92	13.6	32.6	24.1	14.9
597	ICP-MS/MS	9.94	12.5	32.2	21.9	14.4
598	ICP-MS	9.6	12.50	30.7	22.4	13.70
606	ICP-MS/MS	9.91	12.9	33.6	22.3	14.9

Based on the grading criteria for Mn in Whole Blood, 90% of results were satisfactory, with 1 of the 10 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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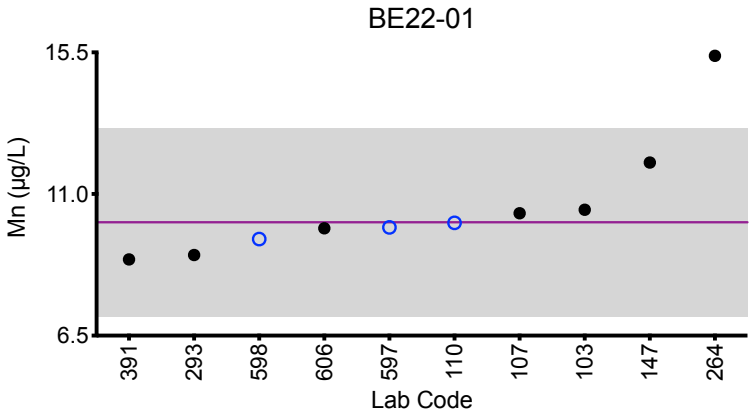
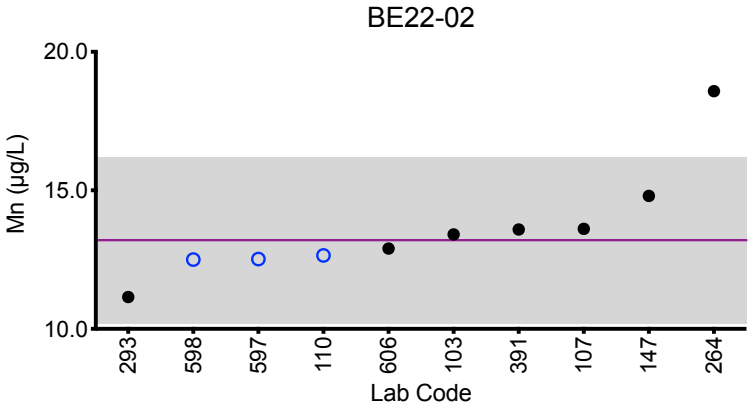
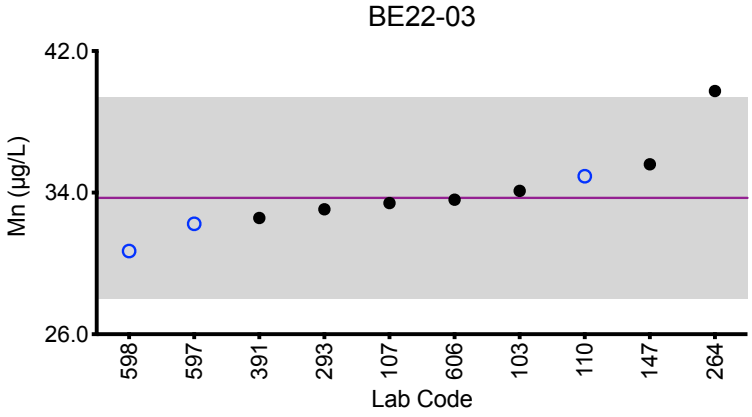
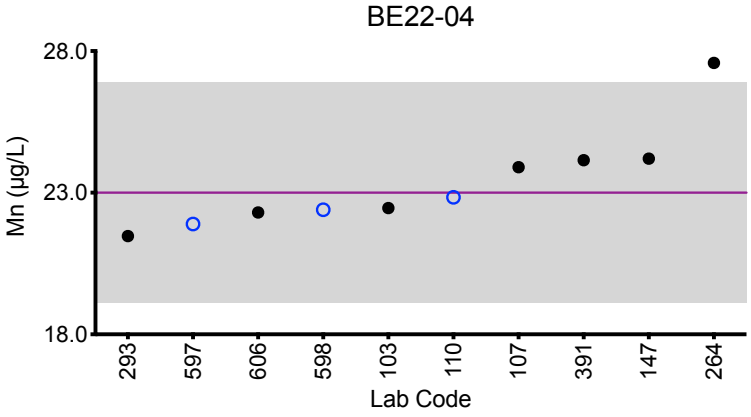
Results for Event #1, 2022: Summary Figures

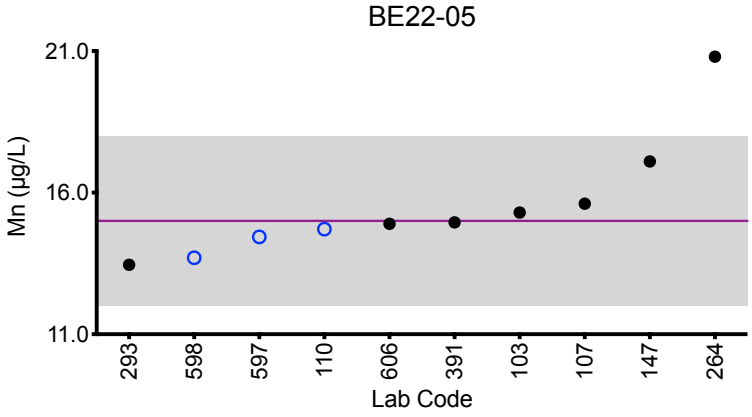
Whole Blood Mn











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:

±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 #1, 2022: Summary Statistics

Whole Blood Pb (µg/dL)					
	BE22-01	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
Target (Robust Mean (x*))	18.3	29.1	12.2	4.46	0.94
Upper Limit	20.3	32.0	14.2	6.46	2.94
Lower Limit	16.3	26.2	10.2	2.46	0.00
Robust SD (s*)	0.7	1.4	0.5	0.25	0.11
Robust RSD (%)	3.8	4.8	4.1	5.6	12
Number of Sample Measurements (N)	14	14	14	13	10
Standard Uncertainty (*u*)	0.2	0.5	0.2	0.09	0.04

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. (https://clsi.org/standards/products/clinical-chemistry-and-toxicology/documents/c40/)

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Results for Event #1, 2022:
Performance of Participating Laboratories

Whole Blood Pb (µg/dL)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
	Target	**18.3**	**29.1**	**12.2**	**4.46**	**0.94**
103	ICP-MS/MS	18.7	29.9	12.4	4.45	0.944
107	ICP-MS/MS	18.395	30.369	11.948	4.608	0.963
110	ICP-MS	18.1	29.0	12.0	4.33	0.90
116	ICP-MS/MS	19.0	30.9	12.7	4.78	<3.00
147	ICP-MS	18.7	29.4	12.6	4.50	0.945
264	ICP-MS	15.60 ↓	24.81 ↓	10.32	3.88	0.77
293	DRC/CC-ICP-MS	18.20	29.36	12.20	4.3	1.03
343	ASV-LeadCare	17.1	27.2	11.3	<3.3	<3.3
391	ETAAS-Z	19.3	28.3	12.4	5.96	2.93
597	ICP-MS/MS	18.1	28.5	11.9	4.30	0.930
598	ICP-MS	17.00	24.60 ↓	10.50	4.0	0.80
605	ICP-MS	21.5 ↑	32.4 ↑	13.5	4.88	1.04
606	ICP-MS/MS	18.2	29.2	12.3	4.43	<1.00
686	ICP-MS	18.6	29.8	12.3	4.53	<1.00

Based on the grading criteria for Pb in Whole Blood, 93% of results were satisfactory, with 2 of the 14 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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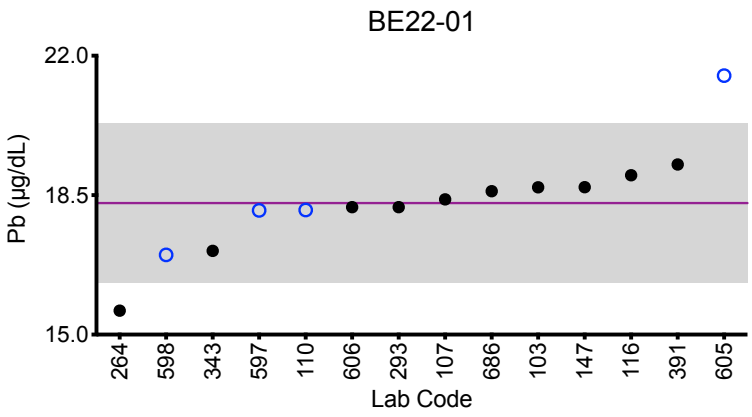
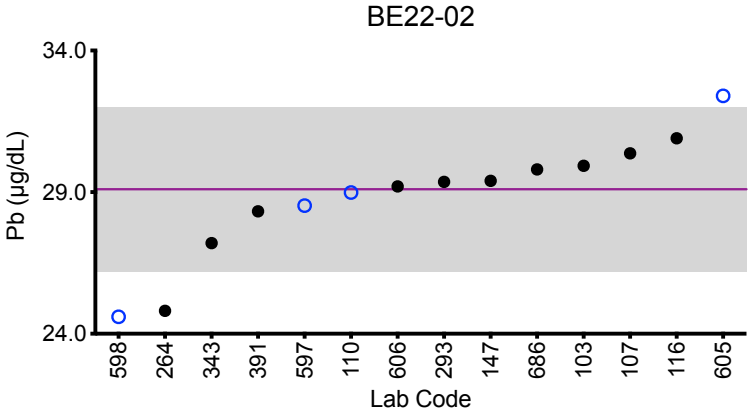
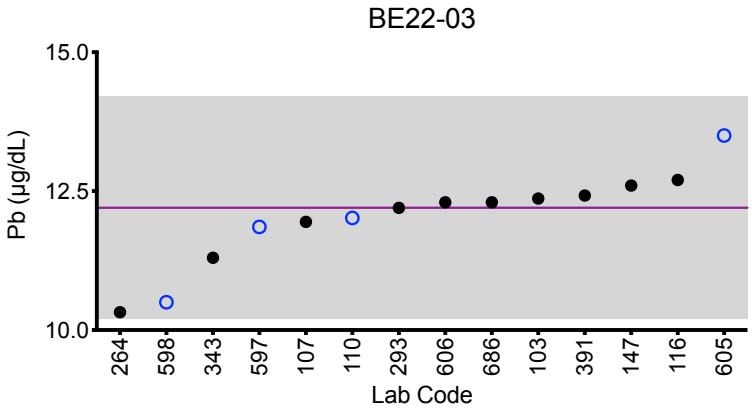
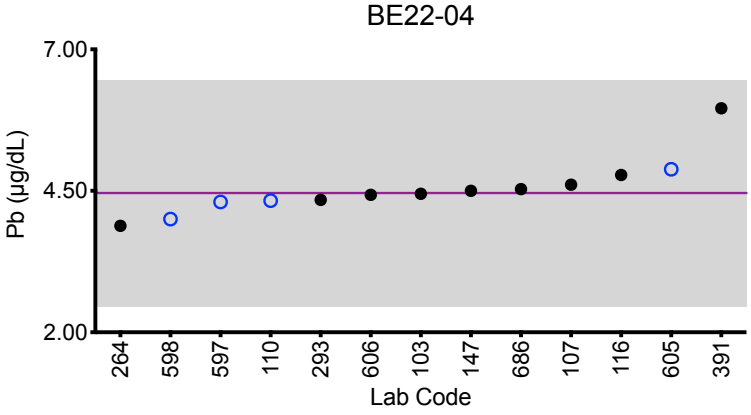
Results for Event #1, 2022: Summary Figures

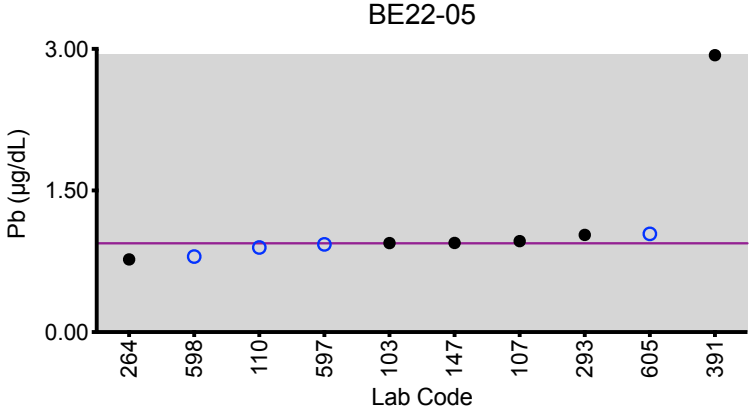
Whole Blood Pb











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

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood Mo (µg/L)

Lab Code	Method	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
103	ICP-MS/MS	<1.50	10.0	6.23	2.32	4.66
147	ICP-MS	0.453	9.59	6.11	2.35	4.27
264	ICP-MS	*8.20	*20.90	*17.30	*10.70	*13.10
442	ICP-MS	0.463	9.32	6.12	2.37	4.18
597	ICP-MS/MS	0.400	9.53	5.83	2.29	4.17
598	DRC/CC-ICP-MS	0.611	8.49	5.48	2.63	4.19

Summary Statistics

	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
Arithmetic Mean ($\bar{x}$)	0.48	9.4	5.9	2.39	4.29
Arithmetic SD (s)	0.09	0.6	0.3	0.14	0.21
Arithmetic RSD (%)	19	6.4	5.0	5.9	4.9
Number of Sample Measurements (N)	4	5	5	5	5

*Denotes a statistical Outlier.

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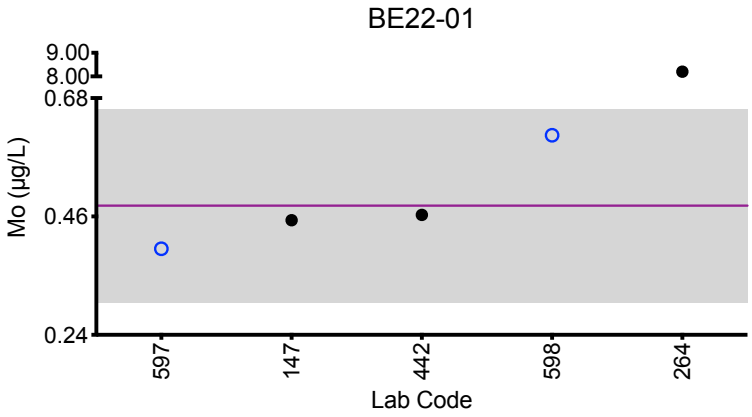
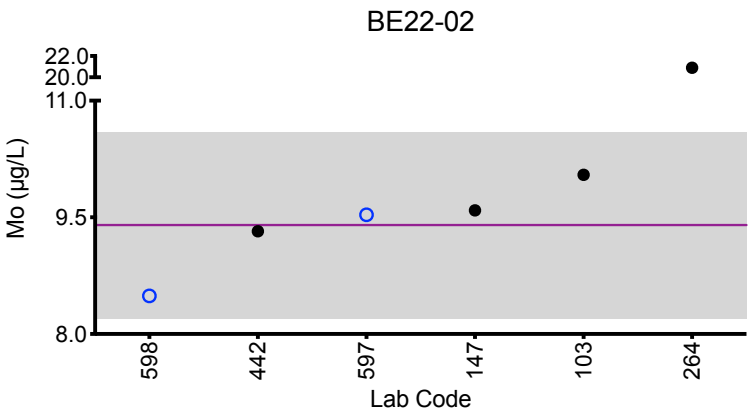
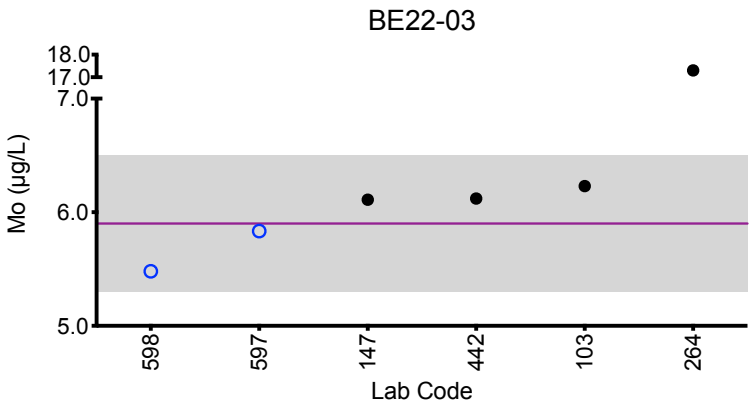
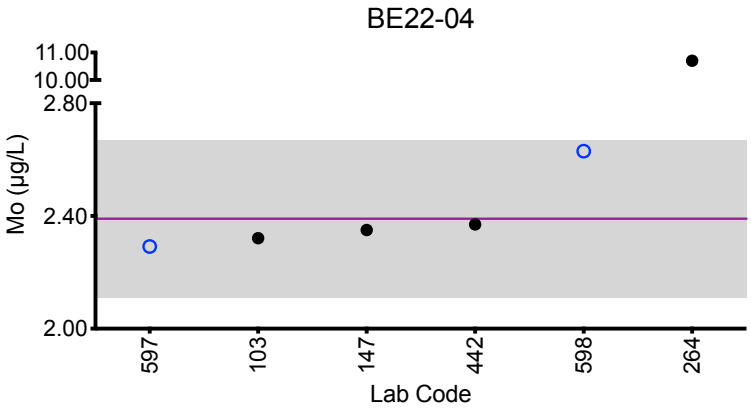
Results for Event #1, 2022: Summary Figures

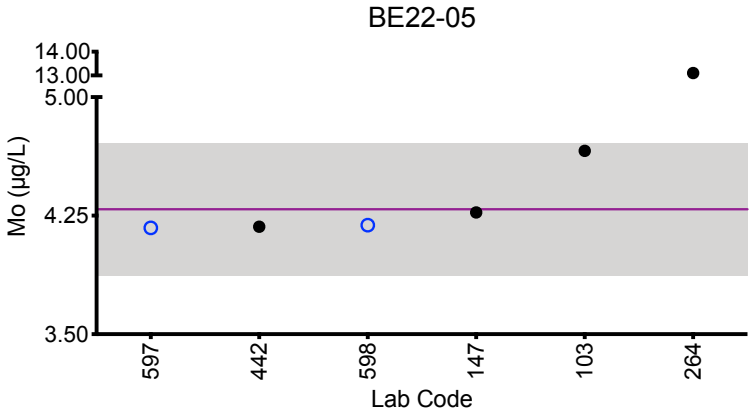
Whole Blood Mo











Legend:

o C/HHEAR Labs ● Other Labs

Horizontal purple line = arithmetic mean of all laboratories.

Gray area = ±2SD of the mean.

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 #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood Sb (µg/L)

Lab Code	Method	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
103	ICP-MS/MS	2.07	4.98	7.17	*3.90	1.63
110	ICP-MS	2.70	5.52	8.27	4.89	1.89
147	ICP-MS	2.92	6.05	8.86	5.33	2.19
264	ICP-MS	2.94	5.97	8.91	5.67	2.17
293	DRC/CC-ICP-MS	2.740	5.73	8.43	5.00	1.97
442	ICP-MS	2.96	6.19	8.89	5.51	2.38
597	ICP-MS/MS	2.72	5.27	7.92	5.01	2.01
598	ICP-MS	3.280	5.26	8.52	5.28	2.16

Summary Statistics

	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
Arithmetic Mean ($\bar{x}$)	2.8	5.6	8.4	5.2	2.05
Arithmetic SD (s)	0.4	0.4	0.6	0.3	0.23
Arithmetic RSD (%)	13	7.1	7.1	5.5	11
Number of Sample Measurements (N)	8	8	8	7	8

*Denotes a statistical Outlier.

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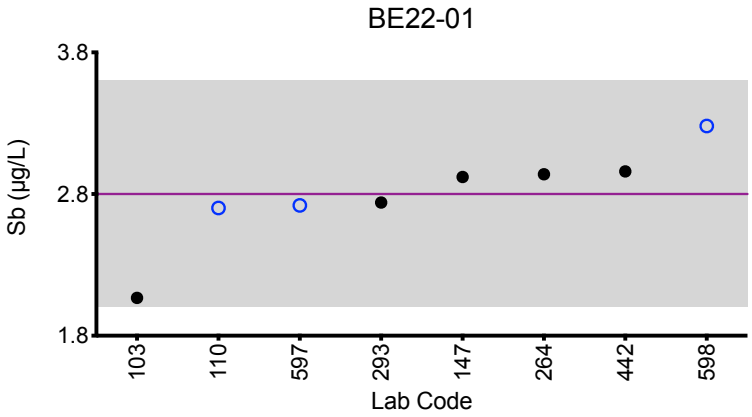
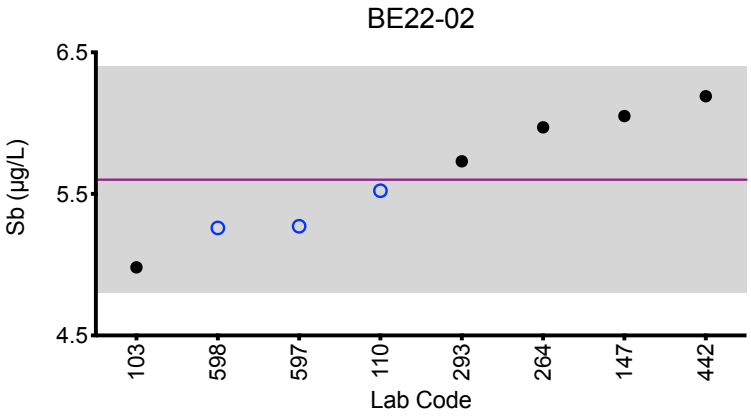
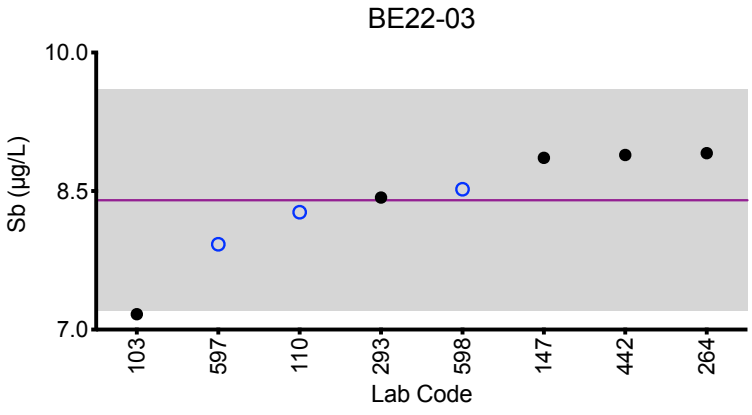
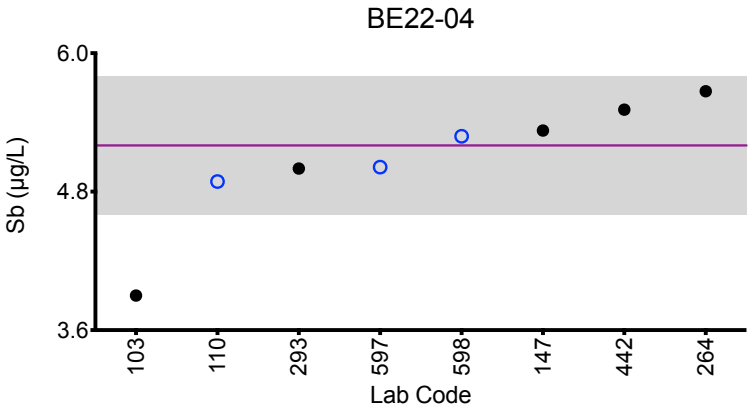
Results for Event #1, 2022: Summary Figures

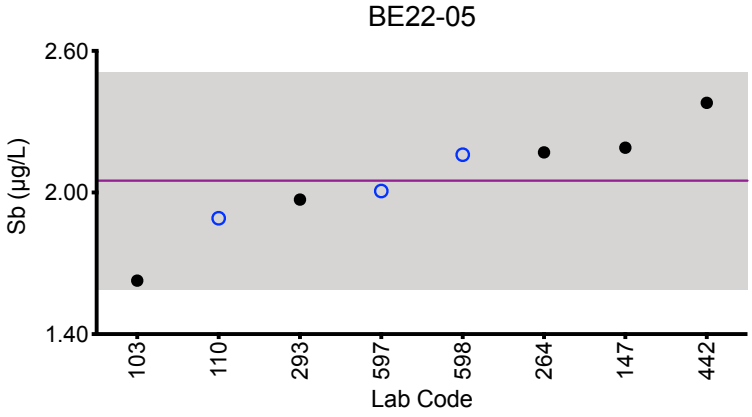
Whole Blood Sb











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 #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood Se (µg/L)

Lab Code	Method	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
103	ICP-MS/MS	169	335	153	411	197
107	ICP-MS/MS	182.2	378.1	160.2	460.5	211.5
110	DRC/CC-ICP-MS	180	336	161	415	202
147	ICP-MS	186	356	167	442	206
293	DRC/CC-ICP-MS	171	335	155	424	197
597	ICP-MS/MS	174	332	154	402	196
598	DRC/CC-ICP-MS	165	306	*133	400	184

Summary Statistics

	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
Arithmetic Mean ($\bar{x}$)	175	340	158	422	199
Arithmetic SD (s)	8	22	5	22	9
Arithmetic RSD (%)	4.6	6.5	3.2	5.2	4.5
Number of Sample Measurements (N)	7	7	6	7	7

*Denotes a statistical Outlier.

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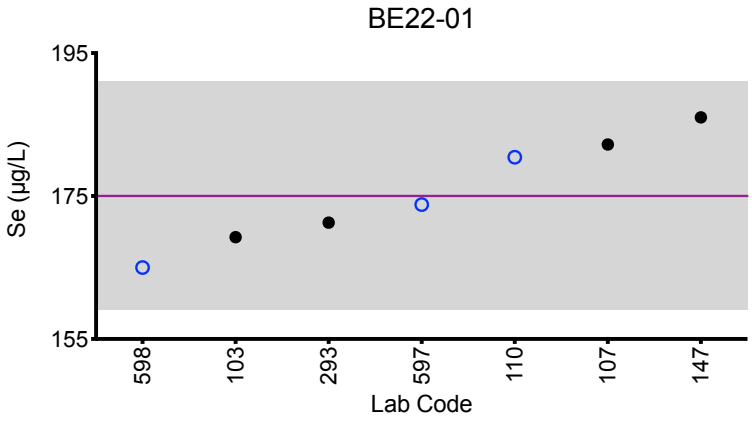
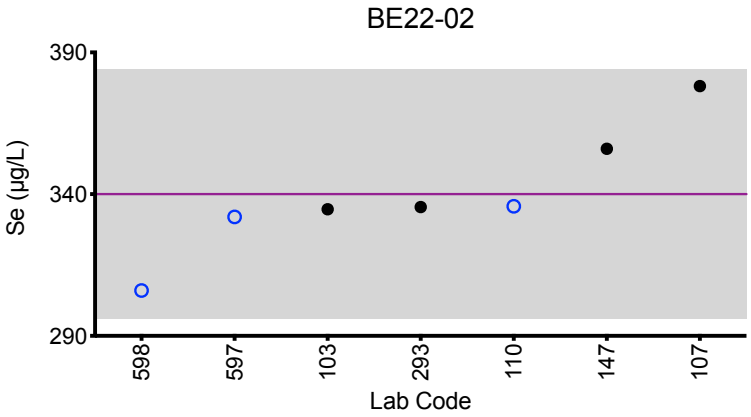
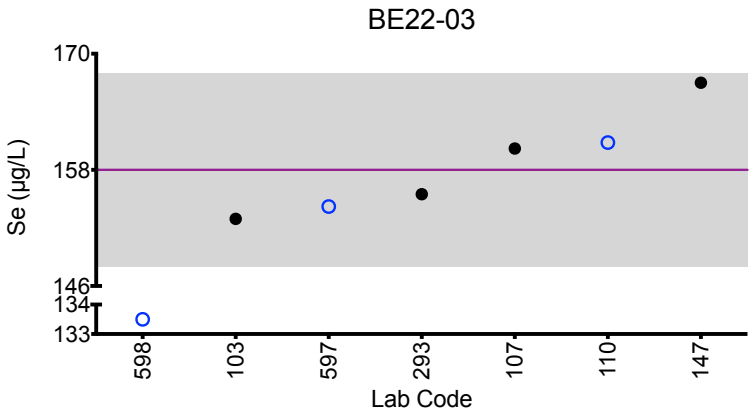
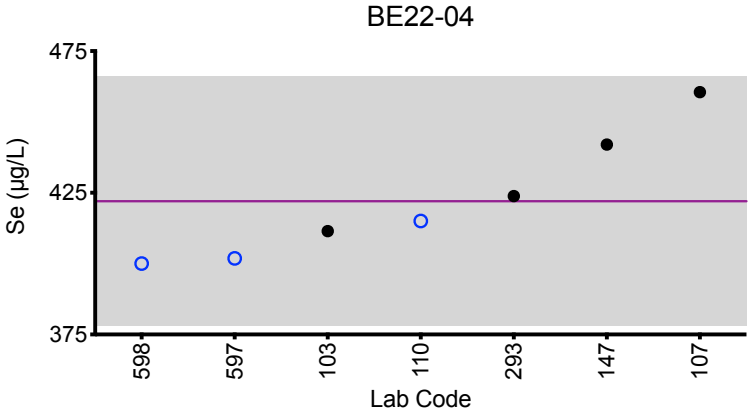
Results for Event #1, 2022: Summary Figures

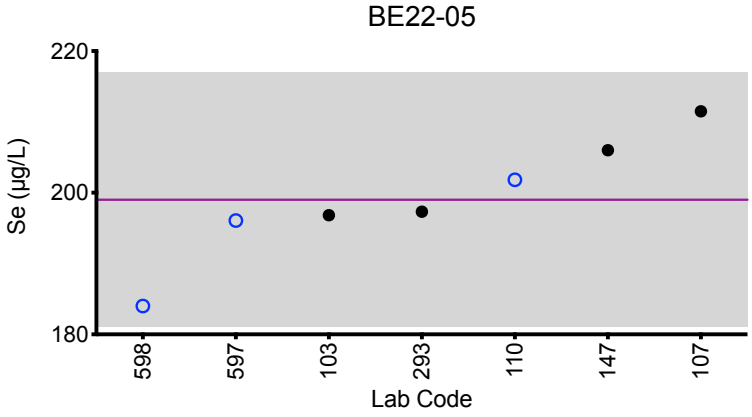
Whole Blood Se











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 #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood Tl (µg/L)

Lab Code	Method	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
103	ICP-MS/MS	0.963	1.72	1.04	2.50	0.329
110	ICP-MS	0.980	1.78	1.03	2.58	0.339
147	ICP-MS	0.940	1.68	0.998	2.47	0.325
264	ICP-MS	0.90	1.65	0.95	2.45	0.28
293	DRC/CC-ICP-MS	0.95	1.64	0.95	2.35	0.31
597	ICP-MS/MS	0.964	1.62	1.00	2.39	0.329
598	ICP-MS	0.96	1.50	0.84	2.54	0.30

Summary Statistics

	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
Arithmetic Mean ($\bar{x}$)	0.95	1.66	0.97	2.47	0.316
Arithmetic SD (s)	0.03	0.09	0.07	0.08	0.021
Arithmetic RSD (%)	2.7	5.4	7.2	3.2	6.6
Number of Sample Measurements (N)	7	7	7	7	7

*Denotes a statistical Outlier.

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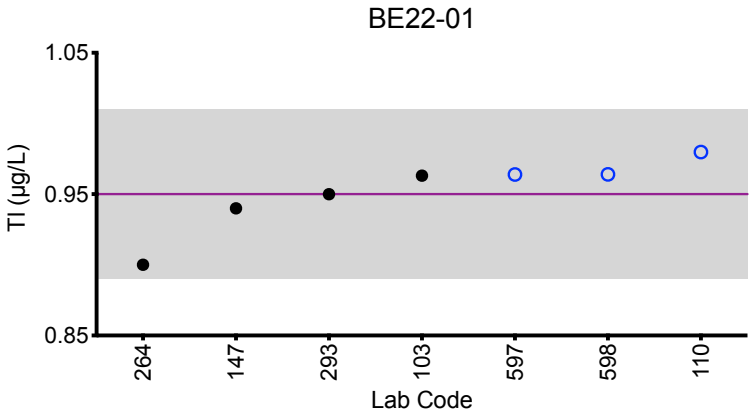
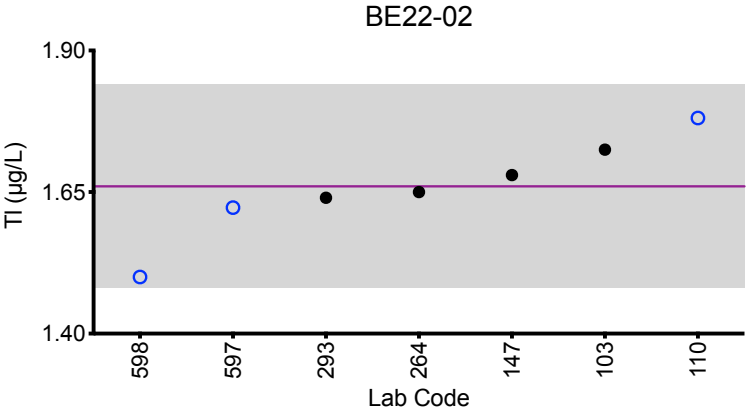
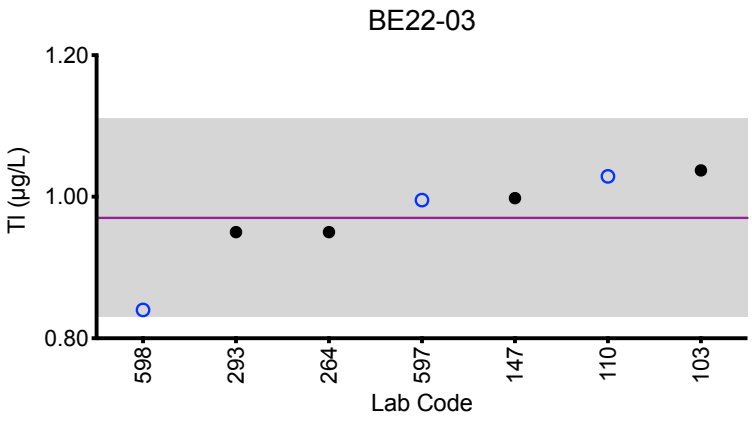
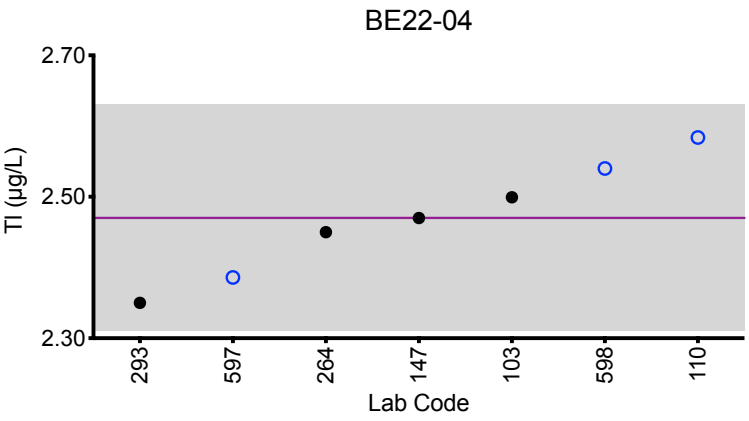
Results for Event #1, 2022: Summary Figures

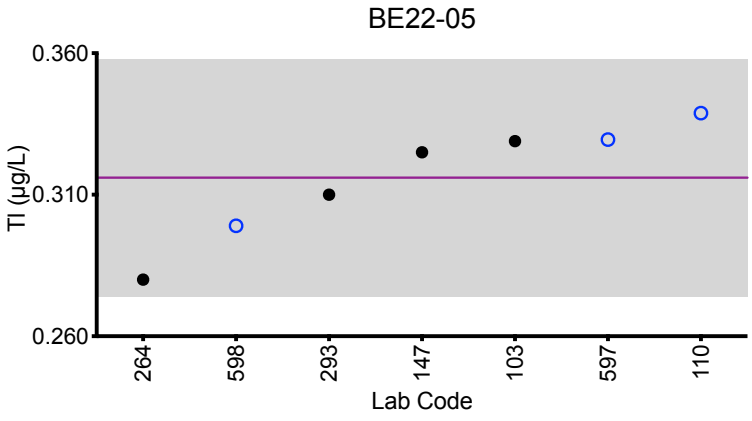
Whole Blood Tl











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 #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood U (µg/L)

Lab Code	Method	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
103	ICP-MS/MS	0.294	0.166	0.210	0.336	0.0694
110	ICP-MS	0.290	0.176	0.218	0.329	0.076
147	ICP-MS	0.298	0.176	0.228	0.331	0.0698
597	ICP-MS/MS	0.274	0.162	0.209	0.307	0.0611
598	ICP-MS	0.338	0.167	0.220	0.298	0.076

Summary Statistics

	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
Arithmetic Mean ($\bar{x}$)	0.30	0.169	0.217	0.320	0.070
Arithmetic SD (s)	0.02	0.006	0.008	0.017	0.006
Arithmetic RSD (%)	8.0	3.6	3.7	5.3	8.6
Number of Sample Measurements (N)	5	5	5	5	5

*Denotes a statistical Outlier.

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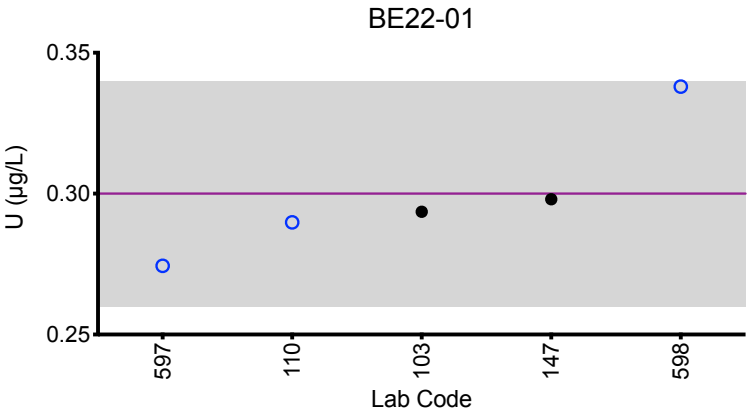
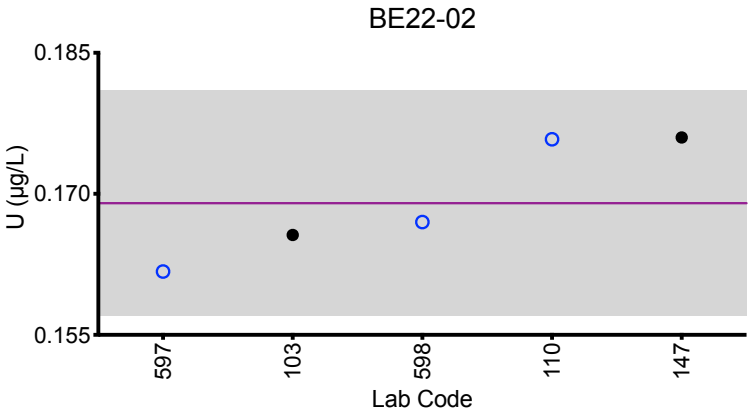
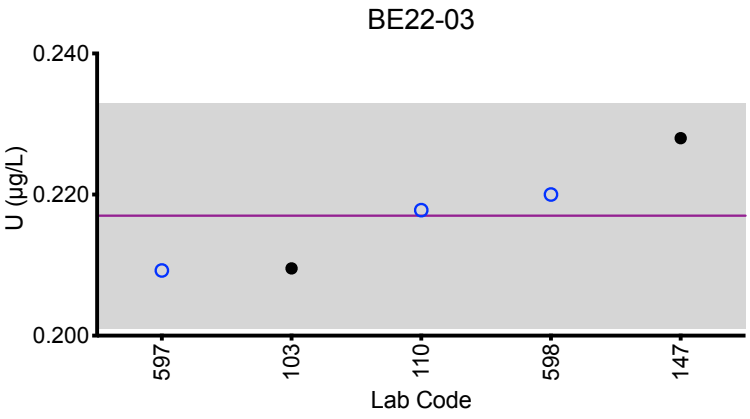
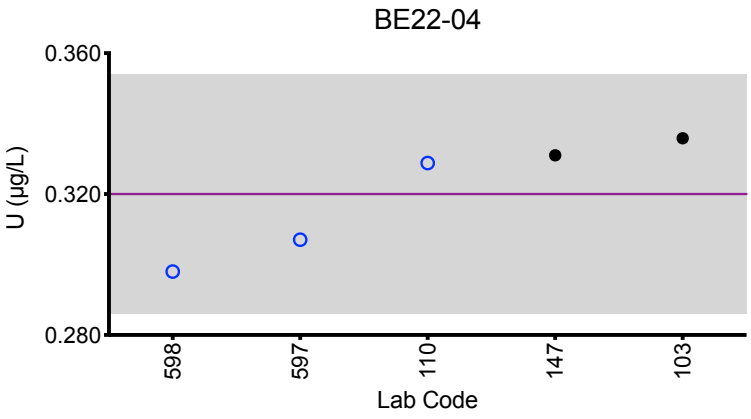
Results for Event #1, 2022: Summary Figures

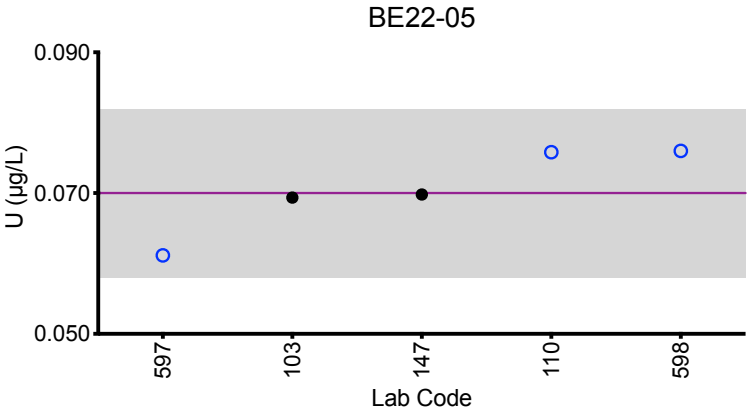
Whole Blood U











Legend:
○ 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 #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood Ba (µg/L)

Lab Code	Method	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
110	ICP-MS	4.3	13.8	8.5	2.9	8.6
147	ICP-MS	4.55	14.3	8.89	2.91	9.18
597	ICP-MS/MS	4.18	13.8	8.24	2.71	8.42
598	ICP-MS	4.3	12.1	7.6	3.4	7.5

Summary Statistics

	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
Arithmetic Mean ($\bar{x}$)	4.32	13.5	8.3	3.0	8.4
Arithmetic SD (s)	0.16	1.0	0.5	0.3	0.7
Arithmetic RSD (%)	3.7	7.4	6.0	10	8.3
Number of Sample Measurements (N)	4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood Be (µg/L)

Lab Code	Method	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
110	ICP-MS	1.53	5.87	5.28	3.72	0.610
147	ICP-MS	1.35	5.59	5.09	3.29	<1.17
597	ICP-MS/MS	1.18	5.37	4.83	3.14	0.60
598	ICP-MS	0.94	5.82	4.120	3.10	0.61

Summary Statistics

	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
Arithmetic Mean ($\bar{x}$)	1.3	5.7	4.8	3.3	0.605
Arithmetic SD (s)	0.3	0.2	0.5	0.3	0.007
Arithmetic RSD (%)	20	4.1	10	8.5	1.2
Number of Sample Measurements (N)	4	4	4	4	3

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood Cs (µg/L)

Lab Code	Method	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
110	ICP-MS	1.41	1.32	1.45	1.36	1.33
147	ICP-MS	1.44	1.29	1.45	1.36	1.27
597	ICP-MS/MS	1.55	1.41	1.55	1.48	1.38
598	ICP-MS	1.32	1.20	1.23	1.27	1.21

Summary Statistics

	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
Arithmetic Mean ($\bar{x}$)	1.43	1.31	1.42	1.37	1.30
Arithmetic SD (s)	0.09	0.09	0.14	0.09	0.07
Arithmetic RSD (%)	6.3	6.9	9.9	6.6	5.4
Number of Sample Measurements (N)	4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood Cu (µg/L)

Lab Code	Method	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
110	ICP-MS	2863	1915	834	1044	1224
147	ICP-MS	2853	1887	864	1042	1201
597	ICP-MS/MS	2650	1780	775	959	1140
598	ICP-MS	2630	1650	726	941	1020

Summary Statistics

	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
Arithmetic Mean ($\bar{x}$)	2750	1810	800	1000	1150
Arithmetic SD (s)	130	120	60	50	90
Arithmetic RSD (%)	4.7	6.6	7.5	5.0	7.8
Number of Sample Measurements (N)	4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood Ni (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
110	DRC/CC-ICP-MS	72.3	5.21	23.2	4.58	12.2
147	ICP-MS	75.2	5.54	24.4	4.16	12.9
597	ICP-MS/MS	72.5	5.02	21.8	4.03	12.7
598	ICP-MS	68.0	5.64	20.50	5.78	13.4
Summary Statistics						
		BE22-01	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
Arithmetic Mean ($\bar{x}$)		72	5.4	22.5	4.6	12.8
Arithmetic SD (s)		3	0.3	1.7	0.8	0.5
Arithmetic RSD (%)		4.2	5.4	7.6	17	3.9
Number of Sample Measurements (N)		4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood Pt (µg/L)

Lab Code	Method	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
110	ICP-MS	5.57	0.48	0.42	0.69	4.77
293	DRC/CC-ICP-MS	4.700	0.460	0.37	0.58	3.99
598	ICP-MS	4.780	0.417	0.63	0.66	3.88

Summary Statistics

	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
Arithmetic Mean ($\bar{x}$)	5.0	0.45	0.47	0.64	4.2
Arithmetic SD (s)	0.5	0.03	0.14	0.06	0.5
Arithmetic RSD (%)	10	6.7	30	9.4	12
Number of Sample Measurements (N)	3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood Sn (µg/L)

Lab Code	Method	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
110	ICP-MS	2.57	4.19	0.42	2.89	0.91
147	ICP-MS	2.81	4.71	<0.368	3.21	0.765
597	ICP-MS/MS	2.58	4.20	0.383	2.87	0.756
598	ICP-MS	2.42	3.440	<0.5	2.45	0.51

Summary Statistics

	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
Arithmetic Mean ($\bar{x}$)	2.60	4.1	0.40	2.9	0.74
Arithmetic SD (s)	0.16	0.5	0.02	0.3	0.17
Arithmetic RSD (%)	6.2	12	5.0	10	23
Number of Sample Measurements (N)	4	4	2	4	4

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood Sr (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
103	ICP-MS/MS	26.0	25.8	26.2	24.3	25.2
147	ICP-MS	25.6	24.6	26.5	24.4	23.8
597	ICP-MS/MS	26.2	25.8	26.5	24.7	24.8
Summary Statistics						
		BE22-01	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
Arithmetic Mean ($\bar{x}$)		25.9	25.4	26.42	24.5	24.6
Arithmetic SD (s)		0.3	0.7	0.16	0.2	0.7
Arithmetic RSD (%)		1.2	2.8	0.61	0.90	2.8
Number of Sample Measurements (N)		3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood Ti (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
200	DRC/CC-ICP-MS	7.4	4.6	4.4	4.8	3.5
442	DRC/CC-ICP-MS	7.90	2.65	3.43	5.12	2.89
597	ICP-MS/MS	7.87	2.95	4.65	5.64	4.25
Summary Statistics						
		BE22-01	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
Arithmetic Mean ($\bar{x}$)		7.7	3.4	4.2	5.2	3.5
Arithmetic SD (s)		0.3	1.1	0.6	0.4	0.7
Arithmetic RSD (%)		3.9	32	14	7.7	20
Number of Sample Measurements (N)		3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood V (µg/L)

Lab Code	Method	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
110	DRC/CC-ICP-MS	0.387	0.603	0.211	0.808	0.134
147	DRC/CC-ICP-MS	0.354	0.592	0.0842	0.745	0.117
597	ICP-MS/MS	0.376	0.661	0.144	0.766	0.188
598	DRC/CC-ICP-MS	<0.5	<0.5	<0.5	0.71	<0.5

Summary Statistics

	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
Arithmetic Mean ($\bar{x}$)	0.37	0.62	NA	0.76	0.15
Arithmetic SD (s)	0.02	0.04	NA	0.04	0.04
Arithmetic RSD (%)	4.6	6.5	NA	5.3	27
Number of Sample Measurements (N)	3	3	NA	4	3

*Denotes a statistical Outlier.

Statistical data was not calculated for BE22-03 based on a lack of consensus among participating labs.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood W (µg/L)

Lab Code	Method	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
110	ICP-MS	1.92	0.767	1.18	0.191	0.709
200	ICP-MS	2.10	0.77	1.310	0.22	0.77
597	ICP-MS/MS	1.80	0.696	1.13	0.189	0.647
598	ICP-MS	2.05	0.86	1.08	0.26	0.55

Summary Statistics

	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
Arithmetic Mean ($\bar{x}$)	1.97	0.77	1.18	0.21	0.67
Arithmetic SD (s)	0.14	0.07	0.10	0.03	0.09
Arithmetic RSD (%)	7.1	9.1	8.5	14	13
Number of Sample Measurements (N)	4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Whole Blood Zn (µg/L)

Lab Code	Method	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
110	ICP-MS	6220	7790	5956	5172	7781
147	ICP-MS	6255	7647	6190	5196	7712
597	ICP-MS/MS	6240	7780	6010	5150	7820
598	ICP-MS	5810	6720	5300	4740	6310

Summary Statistics

	BE22-01	BE22-02	BE22-03	BE22-04	BE22-05
Arithmetic Mean ($\bar{x}$)	6130	7500	5900	5060	7400
Arithmetic SD (s)	210	500	400	220	700
Arithmetic RSD (%)	3.4	6.7	6.8	4.3	9.5
Number of Sample Measurements (N)	4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Additional Elements in Whole Blood

Whole Blood Ag (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
147	ICP-MS	<0.302	<0.302	<0.302	<0.302	<0.302

Whole Blood Al (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
147	ICP-MS	<5.13	<5.13	<5.13	<5.13	<5.13
597	ICP-MS/MS	<4.34	4.81	<4.34	0.00	7.55

Whole Blood Bi (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
147	ICP-MS	<0.0334	<0.0334	<0.0334	<0.0334	<0.0334
597	ICP-MS/MS	<0.0423	<0.0423	<0.0423	<0.0423	<0.0423

Whole Blood I (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
147	ICP-MS	32.8	22.9	33.8	47.3	22.3

Whole Blood Li (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
147	ICP-MS	0.660	0.736	0.620	1.11	0.644

Whole Blood Mg (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
597	ICP-MS/MS	26800	30000	26900	27900	29800

Whole Blood Te (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
147	ICP-MS	<0.117	<0.117	<0.117	<0.117	<0.117

Whole Blood Th (µg/L)						
Lab Code	**Method**	**BE22-01**	**BE22-02**	**BE22-03**	**BE22-04**	**BE22-05**
147	ICP-MS	<0.0278	<0.0278	<0.0278	<0.0278	<0.0278
597	ICP-MS/MS	0.00887	0.0233	<0.00875	<0.00875	0.00986

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Event #1, 2022

Trace Elements in Urine

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Trace Elements Laboratory

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Event #1, 2022:
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), titanium (Ti), vanadium (V), tungsten (W), and zinc (Zn). 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 (a) the robust mean calculated from data reported by all laboratories, or (b) if a robust mean is not possible, the arithmetic mean after outlier deletion.

Additional Elements

An additional 23 elements 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, 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 #1, 2022: Summary Statistics

	Urine As (µg/L)				
	UE22-01	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
Target (Robust Mean (x*))	13.8	47.9	111	4.6	34.9
Upper Limit	19.8	57.5	133	10.6	41.9
Lower Limit	7.8	38.3	89	0.0	27.9
Robust SD (s*)	0.5	2.0	4	0.4	1.6
Robust RSD (%)	3.5	4.2	3.9	7.8	4.6
Number of Sample Measurements (N)	16	16	16	15	16
Standard Uncertainty (*u*)	0.1	0.6	1	0.1	0.5

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 #1, 2022:
Performance of Participating Laboratories

Urine As (µg/L)						
Lab Code	**Method**	**UE22-01**	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
	Target	**13.8**	**47.9**	**111**	**4.6**	**34.9**
103	ICP-MS/MS	13.7	47.2	111	4.18	33.1
107	DRC/CC-ICP-MS	13.70	46.78	106.76	4.24	32.93
110	DRC/CC-ICP-MS	14.6	51.1	117	4.94	36.3
116	ICP-MS/MS	13.5	45.8	112	4.78	36.9
147	ICP-MS	13.3	47.5	109	<4.04	33.9
264	ICP-MS	14.29	50.19	114.38	4.59	36.37
293	DRC/CC-ICP-MS	13.38	45.84	109.61	5.14	33.95
324	ICP-MS	13.691	47.616	111.999	4.398	34.004
391	DRC/CC-ICP-MS	32.8 ↑	61.9 ↑	137 ↑	61.0 ↑	64.7 ↑
399	DRC/CC-ICP-MS	13.9	48.0	114	4.50	33.8
442	DRC/CC-ICP-MS	14.5	49.7	117	4.49	35.5
597	ICP-MS/MS	13.4	46.1	108	4.65	32.9
598	DRC/CC-ICP-MS	13.4	47	106	4.16	34.6
605	ICP-MS	13.7	48.9	111	4.53	35.1
606	ICP-MS/MS	13.5	48.5	112	4.53	35.7
686	DRC/CC-ICP-MS	16.8	45.2	104	6.46	36.0

Based on the grading criteria for As in Urine, 94% of results were satisfactory, with 1 of the 16 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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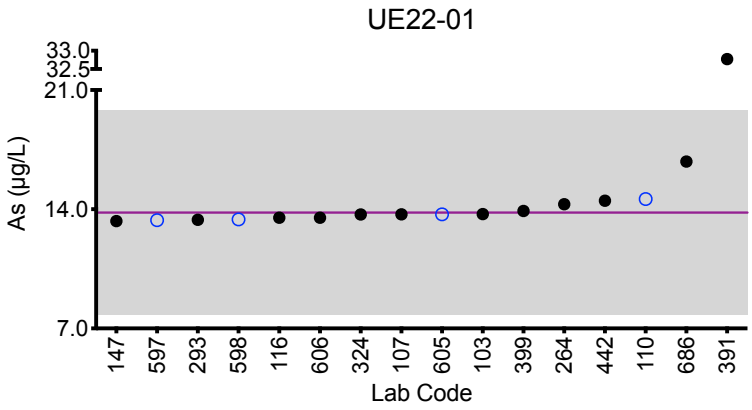
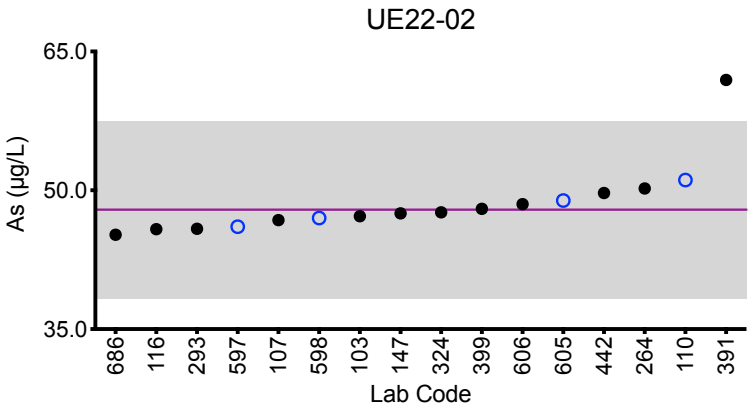
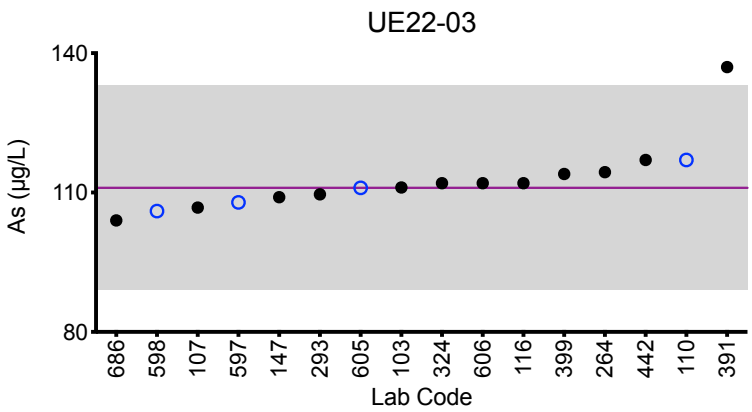
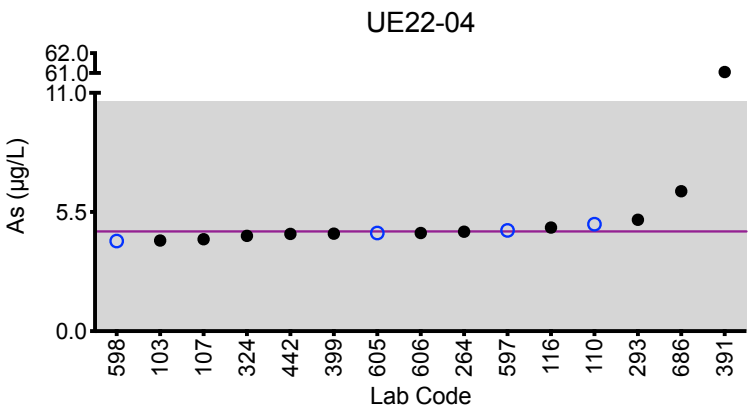
Results for Event #1, 2022: Summary Figures

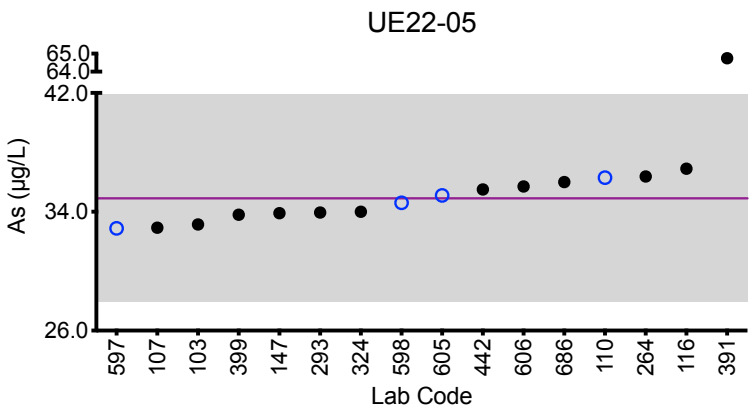
Urine As











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 #1, 2022: Summary Statistics

	Urine Ba (µg/L)				
	UE22-01	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
Target (Robust Mean (x*))	13.1	1.04	5.8	2.08	8.9
Upper Limit	15.7	2.04	7.0	3.08	10.7
Lower Limit	10.5	0.04	4.6	1.08	7.1
Robust SD (s*)	0.5	0.06	0.3	0.09	0.3
Robust RSD (%)	3.8	5.8	4.5	4.3	3.6
Number of Sample Measurements (N)	11	10	11	11	11
Standard Uncertainty (*u*)	0.2	0.02	0.1	0.03	0.1

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 #1, 2022:
Performance of Participating Laboratories

		Urine Ba (µg/L)				
Lab Code	**Method**	**UE22-01**	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
	Target	**13.1**	**1.04**	**5.8**	**2.08**	**8.9**
107	ICP-MS	13.314	1.049	5.983	2.056	8.759
110	ICP-MS	12.8	1.04	5.61	2.07	8.69
116	ICP-MS/MS	12.4	0.951	5.56	1.94	8.54
147	ICP-MS	13.0	1.02	5.70	2.06	8.83
264	ICP-MS	11.26	0.89	4.93	1.71	7.32
399	ICP-MS/MS	13.7	1.12	6.15	2.20	9.12
597	ICP-MS/MS	12.7	<1.56	5.90	2.08	8.98
598	ICP-MS	13.2	1	5.98	2.12	9.21
605	ICP-MS	13.6	1.11	6.08	2.21	9.33
606	ICP-MS/MS	13.4	1.05	5.66	2.43	9.09
686	ICP-MS	13.5	1.05	5.95	2.03	9.16

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

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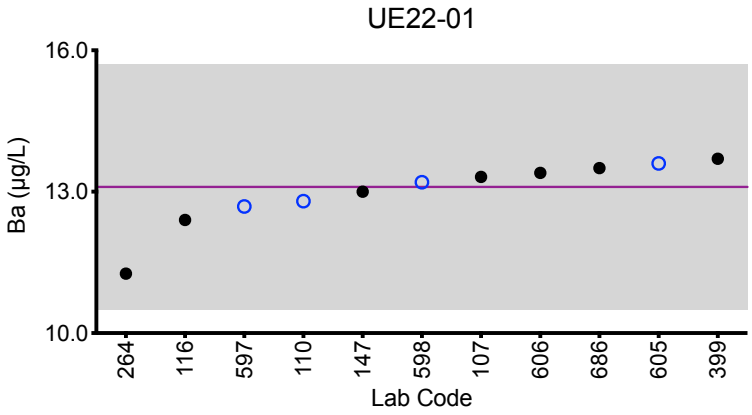
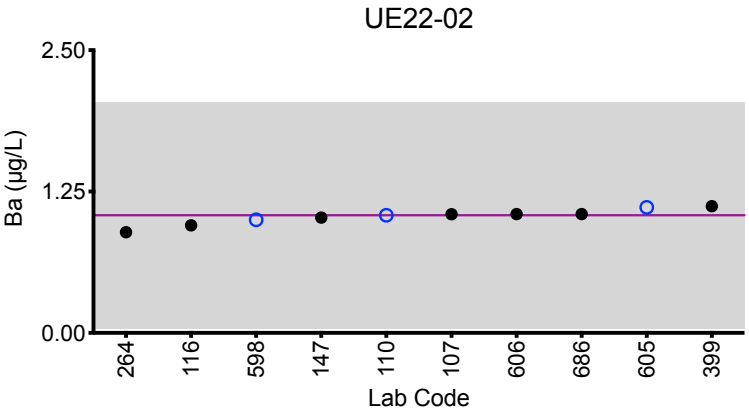
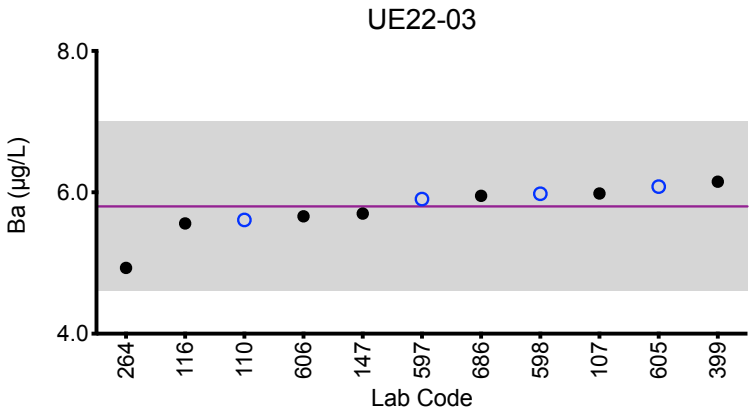
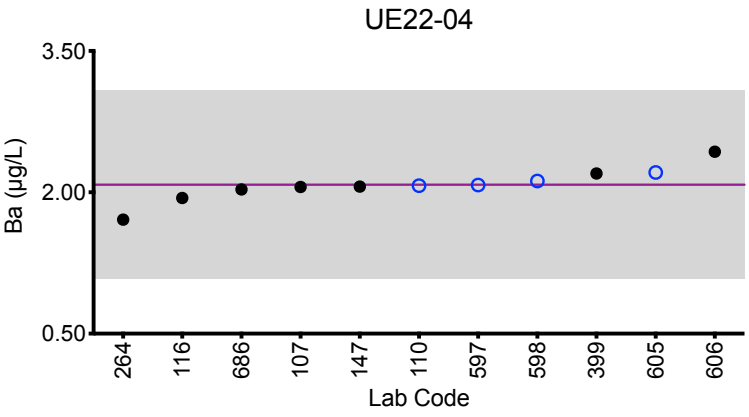
Results for Event #1, 2022: Summary Figures

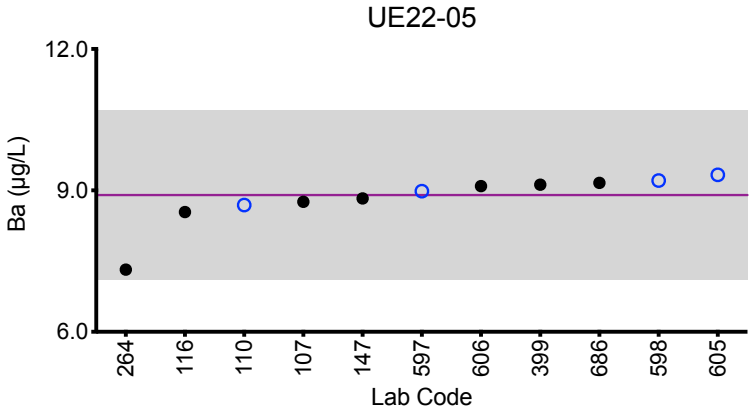
Urine Ba











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 #1, 2022: Summary Statistics

	Urine Be (µg/L)				
	UE22-01	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
Target (Robust Mean (x*))	0.82	12.8	8.6	1.50	2.34
Upper Limit	1.82	15.4	10.3	2.50	3.34
Lower Limit	0.00	10.2	6.9	0.50	1.34
Robust SD (s*)	0.05	0.6	0.5	0.07	0.10
Robust RSD (%)	6.1	4.7	5.8	4.7	4.3
Number of Sample Measurements (N)	11	11	11	11	11
Standard Uncertainty (*u*)	0.02	0.2	0.2	0.03	0.04

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

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Results for Event #1, 2022:
Performance of Participating Laboratories

		Urine Be (µg/L)				
Lab Code	**Method**	**UE22-01**	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
	Target	**0.82**	**12.8**	**8.6**	**1.50**	**2.34**
107	ICP-MS	0.793	12.769	8.531	1.572	2.291
110	ICP-MS	0.911	14.4	9.80	1.74	2.65
116	ICP-MS/MS	0.842	13	8.39	1.53	2.28
147	ICP-MS	0.79	12.5	8.74	1.46	2.36
264	ICP-MS	0.69	10.87	7.28	1.28	1.92
293	ICP-MS	0.83	12.65	8.55	1.51	2.35
399	ICP-MS/MS	0.807	12.8	8.24	1.50	2.32
597	ICP-MS/MS	0.787	12.1	7.98	1.44	2.23
598	ICP-MS	0.824	13.7	9.04	1.46	2.51
605	ICP-MS	0.878	13.7	9.52	1.55	2.39
686	ICP-MS	0.865	12.8	8.76	1.52	2.38

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

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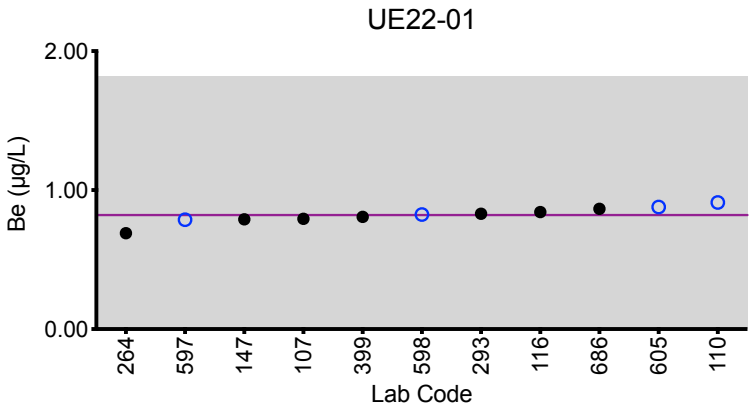
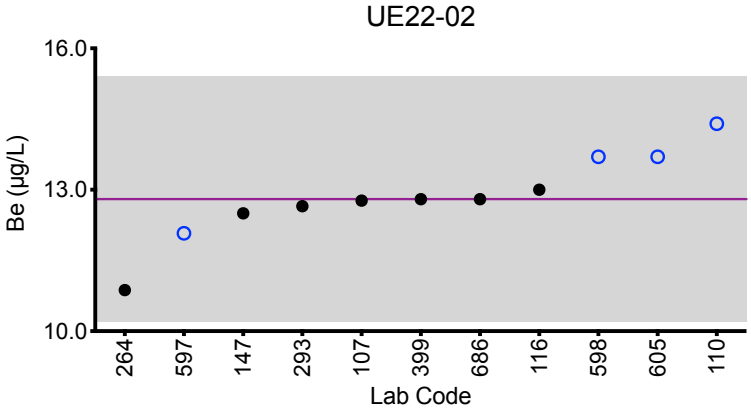
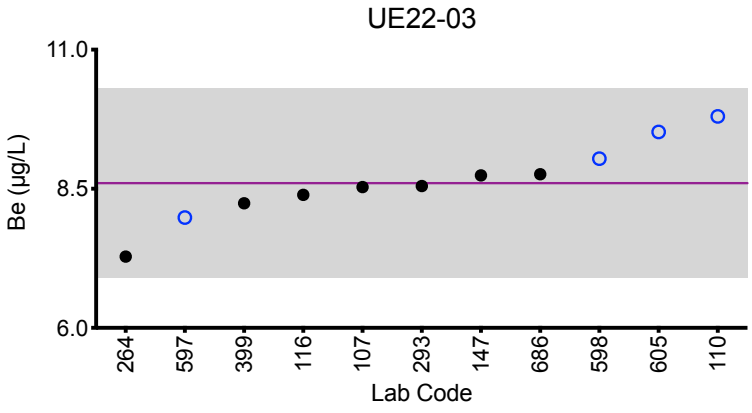
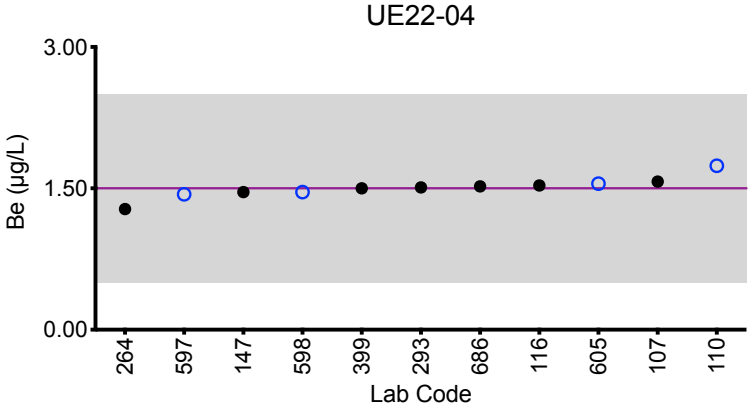
Results for Event #1, 2022: Summary Figures

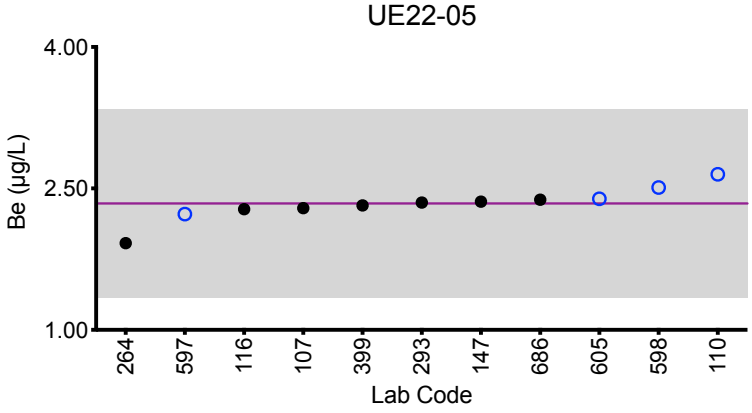
Urine Be











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 #1, 2022:
Summary Statistics

	Urine Cd (µg/L)				
	UE22-01	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
Target (Robust Mean (x*))	1.78	0.59	6.00	4.13	3.35
Upper Limit	2.78	1.59	7.00	5.13	4.35
Lower Limit	0.78	0.00	5.00	3.13	2.35
Robust SD (s*)	0.07	0.04	0.24	0.19	0.18
Robust RSD (%)	3.9	6.3	4.0	4.6	5.4
Number of Sample Measurements (N)	16	15	16	16	16
Standard Uncertainty (*u*)	0.02	0.01	0.07	0.06	0.06

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 #1, 2022:
Performance of Participating Laboratories

		Urine Cd (µg/L)				
Lab Code	**Method**	**UE22-01**	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
	Target	**1.78**	**0.59**	**6.00**	**4.13**	**3.35**
103	ICP-MS/MS	1.82	0.561	5.92	4.06	3.38
107	DRC/CC-ICP-MS	1.848	0.577	6.240	4.175	3.358
110	ICP-MS	1.83	0.572	5.71	3.87	3.27
116	ICP-MS/MS	1.81	0.557	5.92	3.87	3.18
147	ICP-MS	1.94	0.605	6.61	4.34	3.68
264	ICP-MS	1.73	0.59	6.00	4.04	3.30
293	DRC/CC-ICP-MS	1.76	0.62	6.01	4.29	3.47
324	ICP-MS	1.734	<1	5.899	4.019	3.495
391	DRC/CC-ICP-MS	1.66	0.549	6.23	4.41	3.09
399	DRC/CC-ICP-MS	1.81	0.591	6.11	4.24	3.43
442	DRC/CC-ICP-MS	1.78	0.602	5.89	4.22	3.22
597	ICP-MS/MS	1.75	0.572	5.82	4.17	3.21
598	DRC/CC-ICP-MS	1.66	0.644	5.41	3.71	3.18
605	ICP-MS	1.85	0.617	6.35	4.22	3.48
606	ICP-MS/MS	1.71	0.537	5.85	3.95	3.23
686	ICP-MS	1.81	0.662	6.25	4.20	3.69

Based on the grading criteria for Cd 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.

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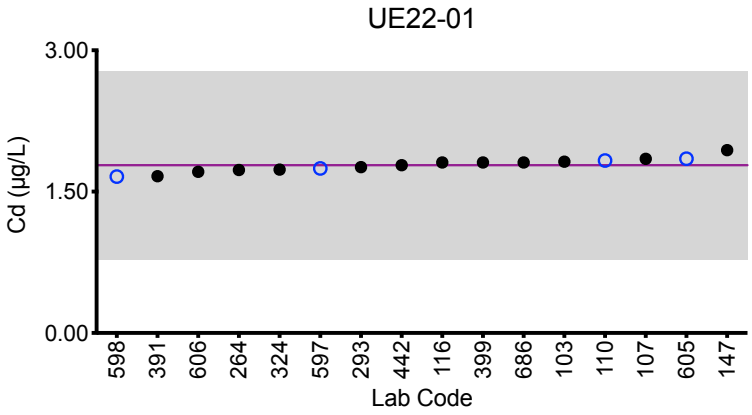
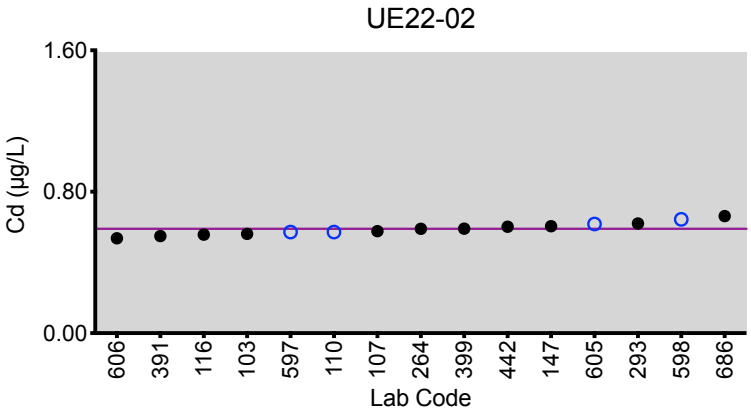
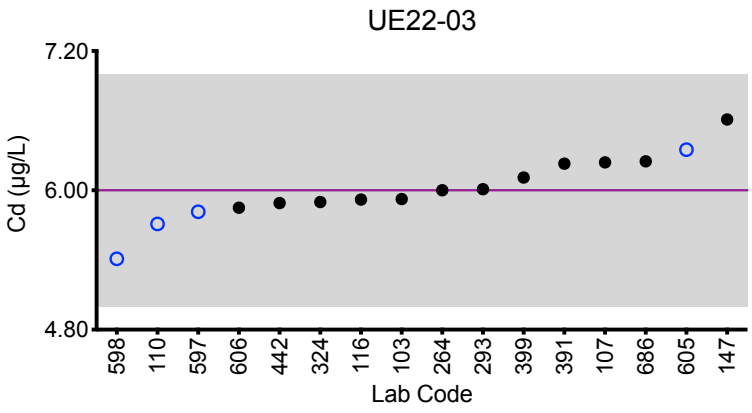
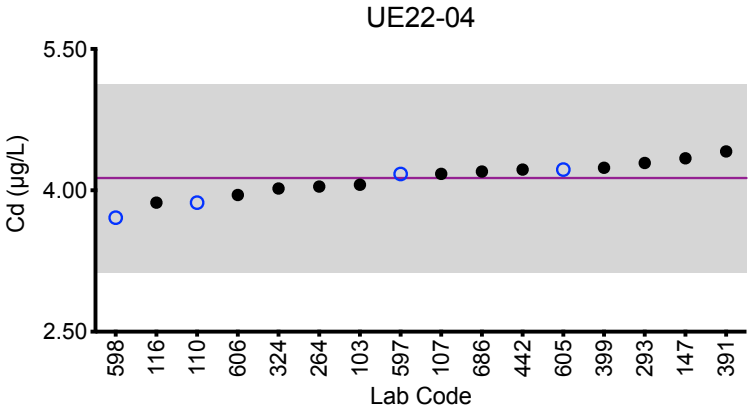
Results for Event #1, 2022: Summary Figures

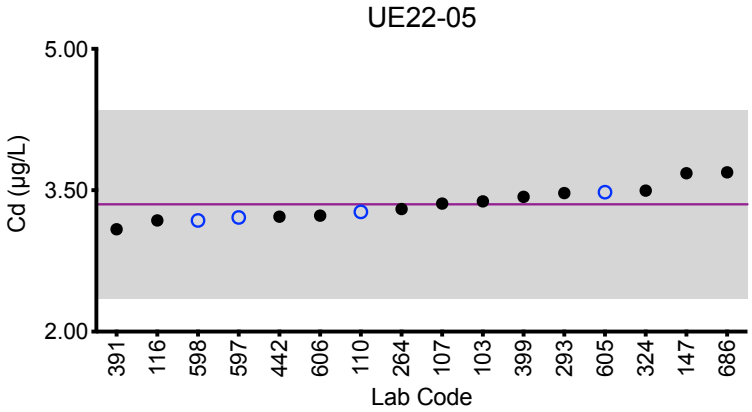
Urine Cd











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 #1, 2022: Summary Statistics

	Urine Co (µg/L)				
	UE22-01	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
Target (Robust Mean (x*))	8.9	0.83	4.47	4.2	4.05
Upper Limit	10.4	2.33	5.97	5.7	5.55
Lower Limit	7.4	0.00	2.97	2.7	2.55
Robust SD (s*)	0.6	0.06	0.19	0.6	0.18
Robust RSD (%)	6.7	7.2	4.3	14	4.4
Number of Sample Measurements (N)	13	12	13	13	13
Standard Uncertainty (*u*)	0.2	0.02	0.07	0.2	0.06

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 #1, 2022:
Performance of Participating Laboratories

Urine Co (µg/L)						
Lab Code	**Method**	**UE22-01**	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
	Target	**8.9**	**0.83**	**4.47**	**4.2**	**4.05**
103	ICP-MS/MS	9.16	0.803	4.47	4.20	4.00
107	ICP-MS	8.424	0.784	4.277	3.586	3.907
110	ICP-MS	9.90	0.912	4.95	4.75	4.54
147	ICP-MS	8.31	0.760	4.16	4.67	3.89
264	ICP-MS	8.27	0.76	4.16	4.56	3.83
293	DRC/CC-ICP-MS	9.06	0.85	4.47	4.83	4.06
324	ICP-MS	8.559	<1	4.364	3.310	3.953
391	DRC/CC-ICP-MS	10.5 ↑	2.71 ↑	6.73 ↑	4.95	5.71 ↑
399	DRC/CC-ICP-MS	9.12	0.817	4.58	4.31	4.18
597	ICP-MS/MS	8.55	0.797	4.44	3.73	3.87
598	ICP-MS	8.55	0.857	4.42	4.44	4.02
605	ICP-MS	9.18	0.835	4.66	3.60	4.12
606	ICP-MS/MS	9.05	0.879	4.56	3.63	4.19

Based on the grading criteria for Co in Urine, 94% of results were satisfactory, with 1 of the 13 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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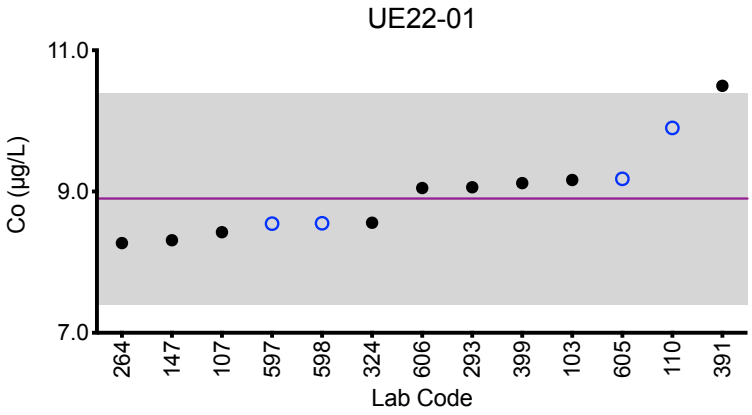
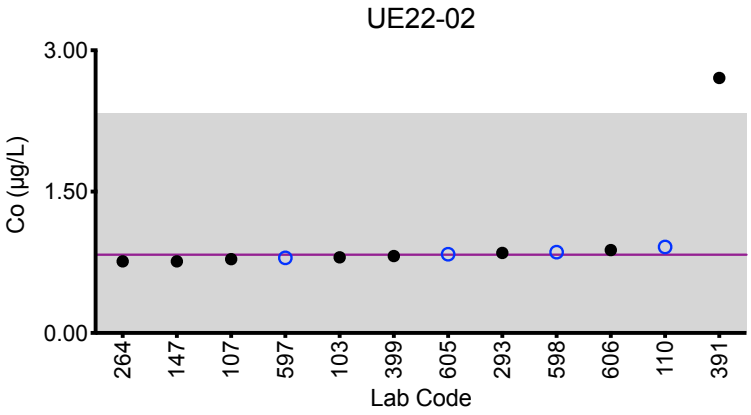
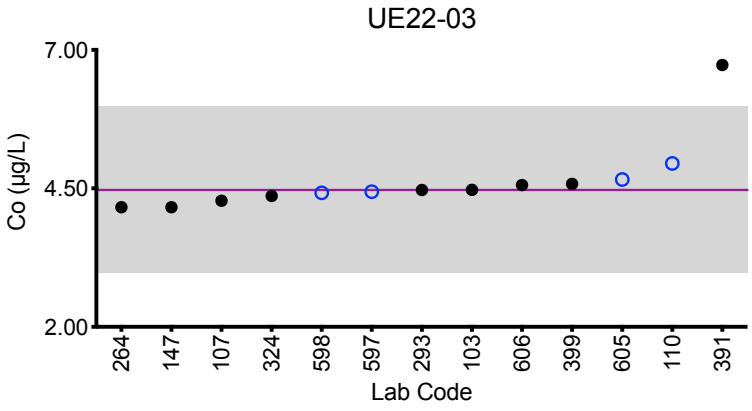
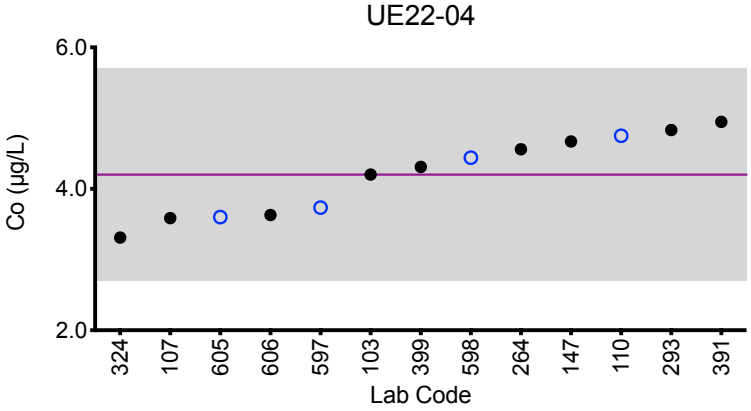
Results for Event #1, 2022: Summary Figures

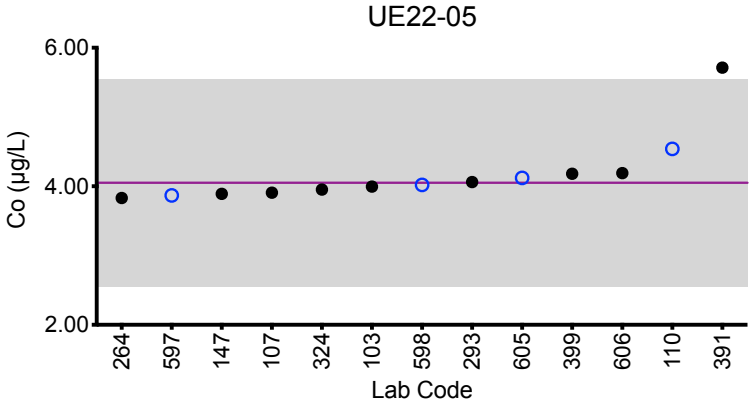
Urine Co











Legend:
○ C/HHEAR Labs ● Other Labs
Horizontal purple line = assigned target value based on the robust mean of all laboratories.
Gray area = acceptable range based on quality specifications:
±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 #1, 2022: Summary Statistics

	Urine Cr (µg/L)				
	UE22-01	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
Target (Robust Mean (x*))	5.2	11.5	1.00	1.16	20.4
Upper Limit	8.2	14.5	4.00	4.16	24.5
Lower Limit	2.2	8.5	0.00	0.00	16.3
Robust SD (s*)	0.5	1.0	0.15	0.23	1.4
Robust RSD (%)	9.6	8.7	15	20	6.9
Number of Sample Measurements (N)	12	12	12	12	12
Standard Uncertainty (*u*)	0.2	0.3	0.05	0.08	0.5

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 #1, 2022:
Performance of Participating Laboratories

		Urine Cr (µg/L)				
Lab Code	**Method**	**UE22-01**	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
	Target	**5.2**	**11.5**	**1.00**	**1.16**	**20.4**
103	ICP-MS/MS	4.51	10.5	0.859	0.766	19.0
107	DRC/CC-ICP-MS	5.08	11.35	0.87	0.99	19.48
110	DRC/CC-ICP-MS	5.70	12.6	1.08	1.37	22.1
116	ICP-MS/MS	5.58	12.6	1.15	1.30	23.0
147	DRC/CC-ICP-MS	4.81	10.8	0.842	1.12	19.9
264	ICP-MS	4.67	10.61	0.93	1.20	19.19
293	DRC/CC-ICP-MS	5.29	11.24	1.02	1.01	20.07
324	ICP-MS	5.410	11.777	1.152	1.325	21.042
391	DRC/CC-ICP-MS	14.3 ↑	18.9 ↑	6.89 ↑	24.0 ↑	34.6 ↑
597	ICP-MS/MS	4.77	10.9	0.922	1.00	19.1
598	DRC/CC-ICP-MS	4.97	10.8	0.895	0.994	19.6
605	ICP-MS	5.30	12.5	1.05	1.29	21.7

Based on the grading criteria for Cr in Urine, 92% of results were satisfactory, with 1 of the 12 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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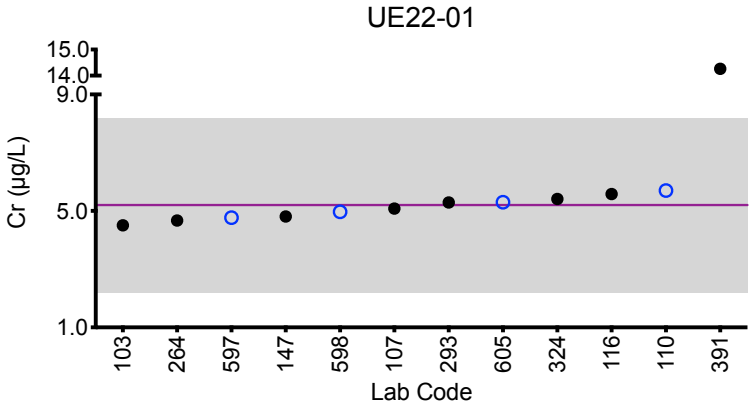
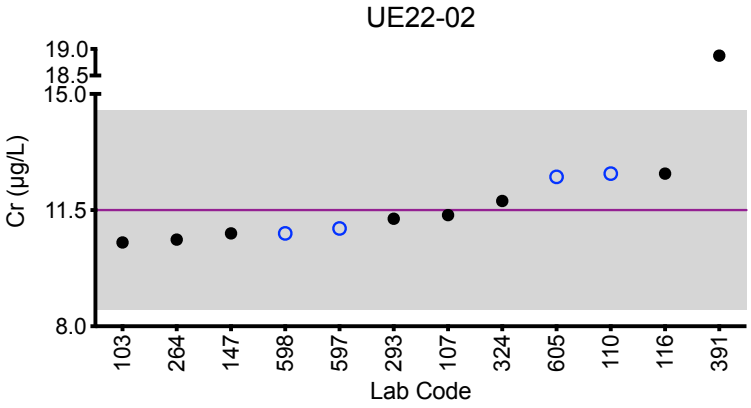
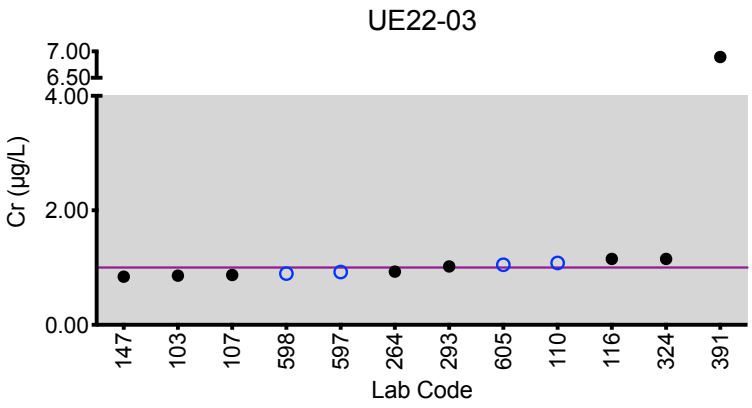
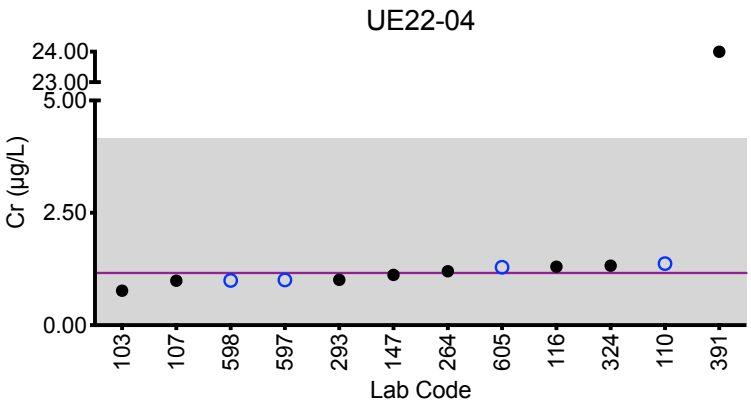
Results for Event #1, 2022: Summary Figures

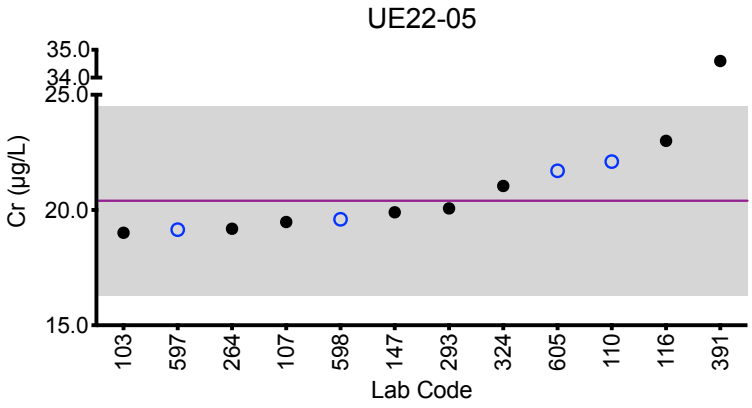
Urine Cr











Legend:

o C/HHEAR Labs ● Other Labs

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

Gray area = acceptable range based on quality specifications:

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

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Results for Event #1, 2022: Summary Statistics

	Urine Hg (µg/L)				
	UE22-01	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
Target (Robust Mean (x*))	45	18.6	0.38	5.9	24.1
Upper Limit	59	24.2	3.38	8.9	31.3
Lower Limit	32	13.0	0.00	2.9	16.9
Robust SD (s*)	4	1.4	0.16	0.4	2.2
Robust RSD (%)	8.0	7.5	42	7.3	9.1
Number of Sample Measurements (N)	14	14	10	14	14
Standard Uncertainty (*u*)	1	0.5	0.06	0.1	0.7

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 #1, 2022:
Performance of Participating Laboratories

		Urine Hg (µg/L)				
Lab Code	**Method**	**UE22-01**	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
	Target	**45**	**18.6**	**0.38**	**5.9**	**24.1**
103	ICP-MS/MS	45.1	18.3	0.303	6.06	25.6
107	DRC/CC-ICP-MS	44.85	18.87	0.22	5.63	24.05
110	ICP-MS	44.1	18.7	0.546	5.95	23.4
116	ICP-MS/MS	38.2	15.4	<0.500	4.78	20.6
147	ICP-MS	46.1	18.4	0.358	5.90	24.9
264	ICP-MS	48.04	19.68	0.31	6.30	26.07
293	DRC/CC-ICP-MS	46.15	18.69	0.43	6.04	25.66
391	DRC/CC-ICP-MS	61.9 ↑	25.1 ↑	1.11	7.50	18.1
442	DRC/CC-ICP-MS	48.1	19.3	0.214	6.18	26.2
597	ICP-MS/MS	42.9	17.8	0.264	5.86	24.0
598	ICP-MS	39.5	16.3	0.555	4.94	22
605	ICP-MS	48.0	19.7	<1.0	5.86	24.6
606	ICP-MS/MS	41.6	17.2	<1.00	5.38	22.4
686	ICP-MS	47.2	20.0	<1.00	6.29	26.9

Based on the grading criteria for Hg in Urine, 97% of results were satisfactory, with 1 of the 14 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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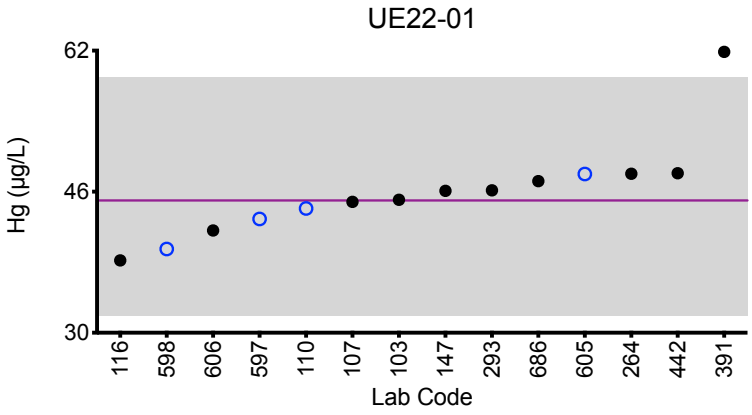
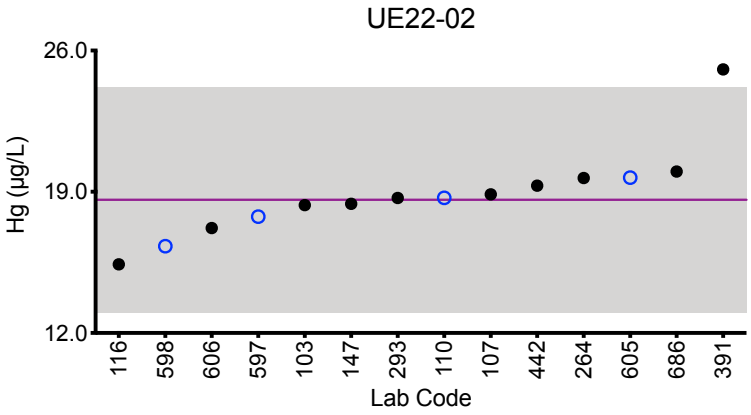
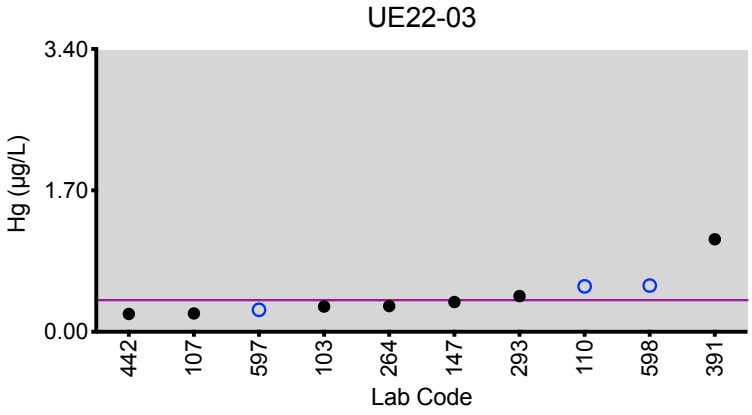
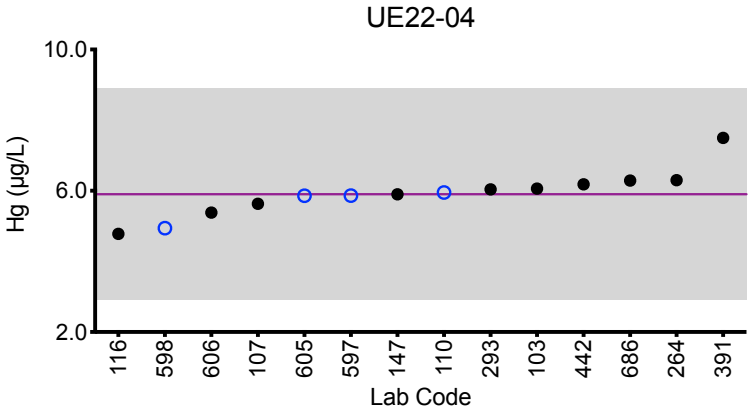
Results for Event #1, 2022: Summary Figures

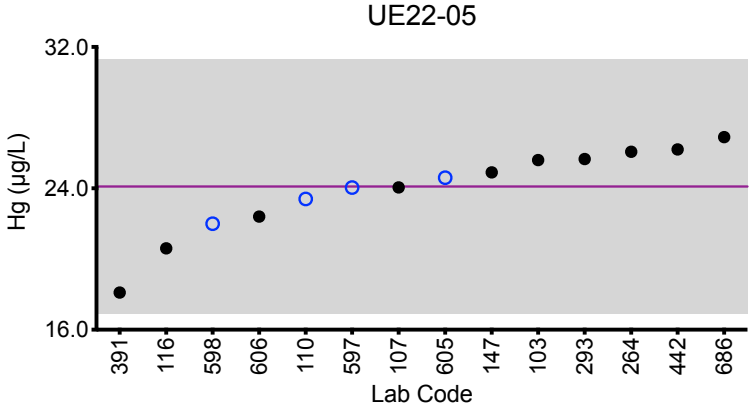
Urine Hg











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 #1, 2022: Summary Statistics

	Urine Mn (µg/L)				
	UE22-01	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
Target (Robust Mean (x*))	0.42	8.0	1.75	4.4	3.04
Upper Limit	0.97	10.0	2.30	5.5	3.80
Lower Limit	0.00	6.0	1.20	3.3	2.28
Robust SD (s*)	0.05	0.5	0.13	0.4	0.19
Robust RSD (%)	12	6.3	7.4	8.3	6.3
Number of Sample Measurements (N)	13	14	14	14	14
Standard Uncertainty (*u*)	0.02	0.2	0.04	0.1	0.06

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. An assessment of clinical laboratory performance for the determination of manganese in blood and urine. Clinical Chemistry and Laboratory Medicine.2016; 54(12): 1921-1928).

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Results for Event #1, 2022:
Performance of Participating Laboratories

		Urine Mn (µg/L)				
Lab Code	**Method**	**UE22-01**	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
	Target	**0.42**	**8.0**	**1.75**	**4.4**	**3.04**
103	ICP-MS/MS	0.398	7.93	1.70	4.23	2.83
107	DRC/CC-ICP-MS	0.407	7.999	1.822	4.336	2.975
110	DRC/CC-ICP-MS	0.485	8.46	1.92	4.64	3.25
116	ICP-MS/MS	0.420	8.98	1.88	4.90	3.47
147	DRC/CC-ICP-MS	0.414	7.47	1.65	4.23	2.92
264	ICP-MS	0.39	7.47	1.62	4.10	2.89
293	DRC/CC-ICP-MS	0.5	7.59	1.74	4.24	2.92
324	ICP-MS	<1	8.052	1.767	4.776	3.225
391	DRC/CC-ICP-MS	0.904	5.14 ↓	0.904 ↓	3.28 ↓	1.99 ↓
399	DRC/CC-ICP-MS	0.382	8.32	1.76	4.76	3.18
597	ICP-MS/MS	0.322	7.57	1.59	4.36	2.99
598	ICP-MS	0.436	7.93	1.76	4.62	3.15
605	ICP-MS	0.468	8.63	2.08	4.19	3.08
606	ICP-MS/MS	0.384	8.04	1.74	5.82 ↑	3.05

Based on the grading criteria for Mn in Urine, 93% of results were satisfactory, with 1 of the 14 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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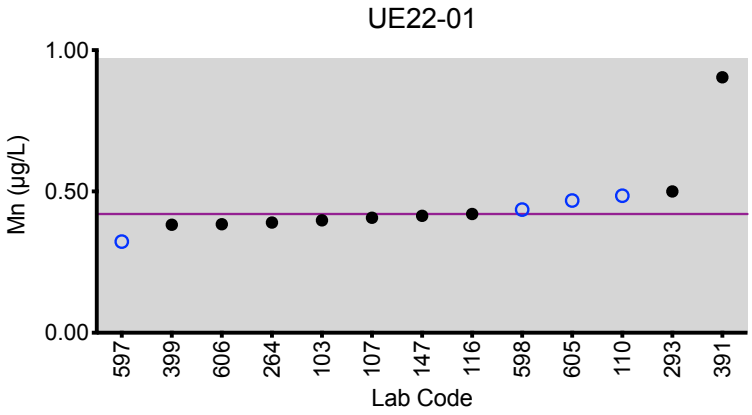
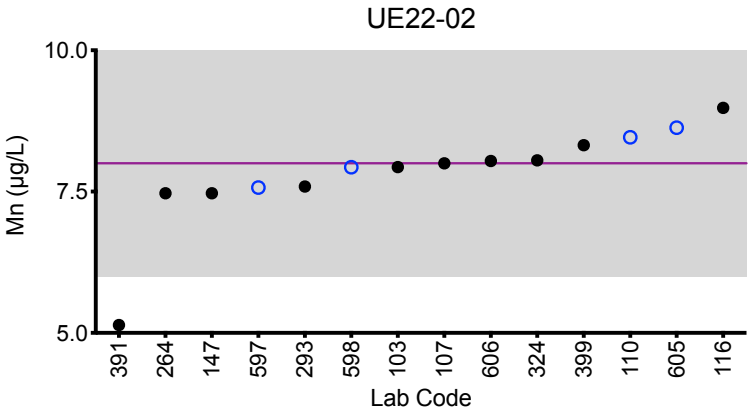
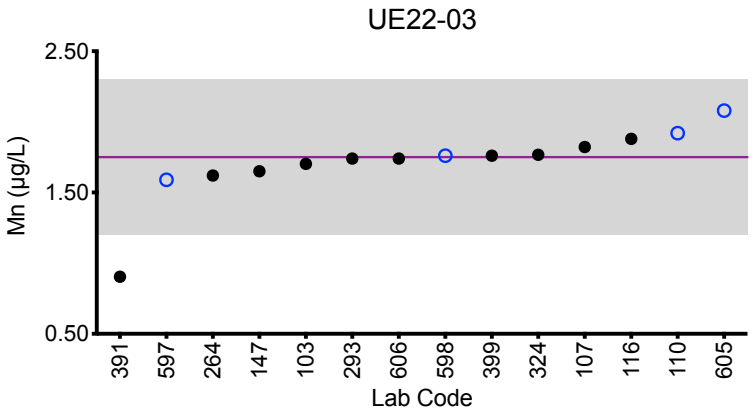
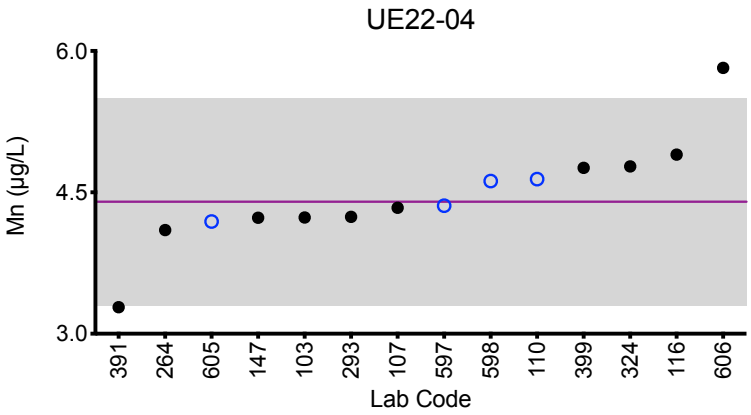
Results for Event #1, 2022: Summary Figures

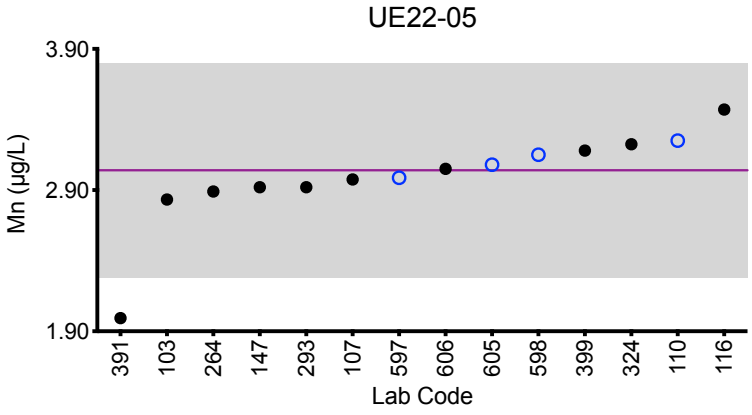
Urine Mn











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 #1, 2022: Summary Statistics

	Urine Pb (µg/L)				
	UE22-01	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
Target (Robust Mean (x*))	10.8	2.74	6.52	14.6	1.01
Upper Limit	13.0	3.74	7.82	17.5	2.01
Lower Limit	8.6	1.74	5.22	11.7	0.01
Robust SD (s*)	0.4	0.09	0.21	0.5	0.05
Robust RSD (%)	3.3	3.3	3.2	3.2	4.6
Number of Sample Measurements (N)	16	16	16	16	16
Standard Uncertainty (*u*)	0.1	0.03	0.06	0.1	0.01

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 #1, 2022:
Performance of Participating Laboratories

		Urine Pb (µg/L)				
Lab Code	**Method**	**UE22-01**	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
	Target	**10.8**	**2.74**	**6.52**	**14.6**	**1.01**
103	ICP-MS/MS	11.0	2.77	6.77	15.0	1.03
107	ICP-MS	11.055	2.779	6.577	14.755	1.020
110	ICP-MS	10.8	2.82	6.69	14.4	1.04
116	ICP-MS/MS	10.8	2.72	6.48	14.4	0.95
147	ICP-MS	10.9	2.74	6.67	14.8	1.10
264	ICP-MS	10.42	2.62	6.30	13.67	0.92
293	DRC/CC-ICP-MS	10.63	2.77	6.55	14.27	1.01
324	ICP-MS	10.462	2.708	6.203	14.446	1.011
391	DRC/CC-ICP-MS	11.1	2.33	6.69	16.4	0.986
399	ICP-MS/MS	10.4	2.66	6.32	14.3	1.01
442	DRC/CC-ICP-MS	11.1	2.85	6.6	15.4	0.981
597	ICP-MS/MS	10.5	2.74	6.38	14.3	0.991
598	ICP-MS	10.1	2.66	6.39	13.6	0.94
605	ICP-MS	11.5	2.95	7.10	15.5	1.07
606	ICP-MS/MS	10.7	2.73	6.35	14.6	0.984
686	ICP-MS	11.0	2.82	6.57	15.2	1.06

Based on the grading criteria for Pb 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.

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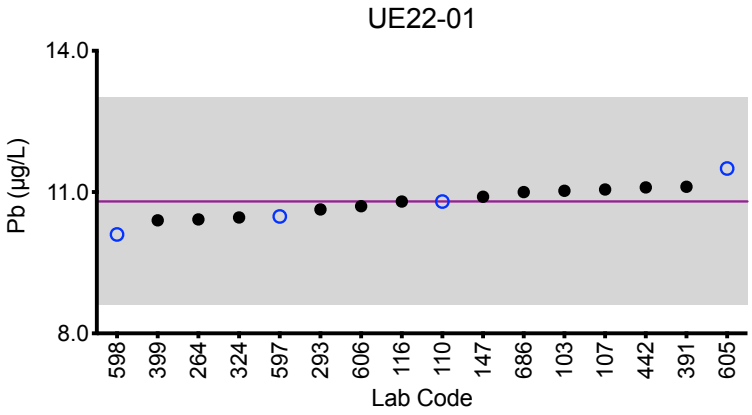
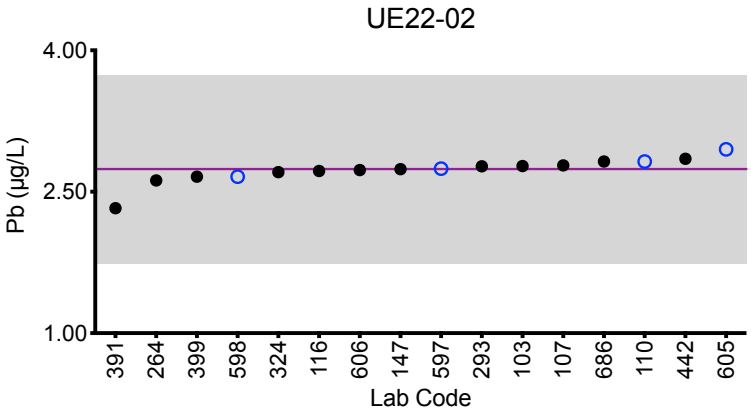
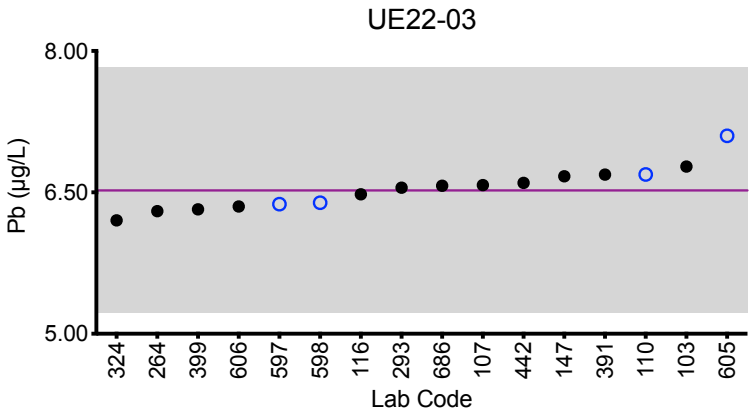
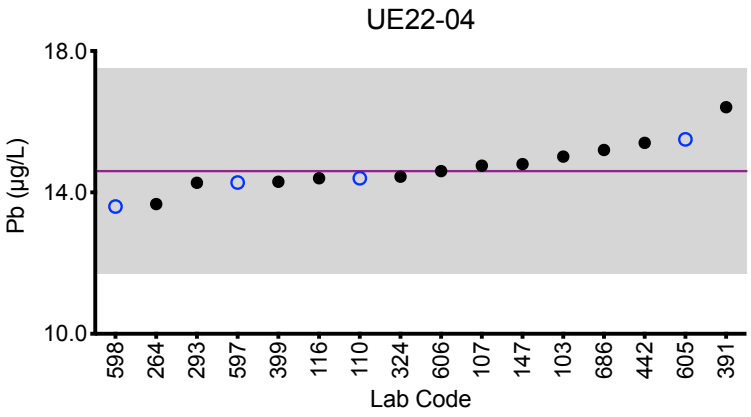
Results for Event #1, 2022: Summary Figures

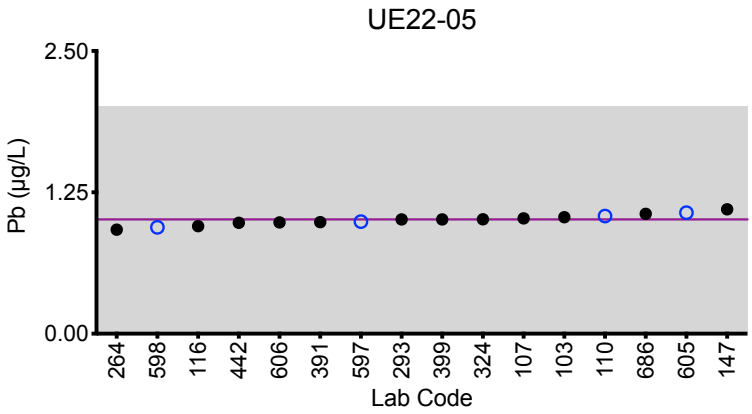
Urine Pb











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 #1, 2022: Summary Statistics

Urine Tl (µg/L)					
	UE22-01	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
Target (Robust Mean (x*))	3.64	4.05	1.73	0.69	2.73
Upper Limit	4.37	4.86	2.08	0.89	3.28
Lower Limit	2.91	3.24	1.38	0.49	2.18
Robust SD (s*)	0.12	0.19	0.08	0.03	0.13
Robust RSD (%)	3.3	4.7	4.6	4.5	4.8
Number of Sample Measurements (N)	14	14	14	14	14
Standard Uncertainty (*u*)	0.04	0.06	0.03	0.01	0.04

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 #1, 2022:
Performance of Participating Laboratories

Urine Tl (µg/L)						
Lab Code	**Method**	**UE22-01**	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
	Target	**3.64**	**4.05**	**1.73**	**0.69**	**2.73**
103	ICP-MS/MS	3.72	4.18	1.79	0.713	2.86
107	ICP-MS	3.687	4.186	1.751	0.691	2.685
110	ICP-MS	4.45 ↑	4.30	2.08	0.786	2.94
116	ICP-MS/MS	3.64	4.12	1.73	0.687	2.73
147	ICP-MS	3.43	3.84	1.62	0.711	2.72
264	ICP-MS	3.47	3.81	1.64	0.63	2.53
293	DRC/CC-ICP-MS	3.66	4.04	1.76	0.69	2.7
391	DRC/CC-ICP-MS	3.72	3.70	1.80	0.698	2.79
399	ICP-MS/MS	3.61	4.05	1.71	0.683	2.70
597	ICP-MS/MS	3.62	3.98	1.66	0.662	2.62
598	ICP-MS	3.52	3.93	1.68	0.627	2.55
605	ICP-MS	3.91	4.38	1.83	0.73	2.92
606	ICP-MS/MS	3.57	4.01	1.70	0.671	2.70
686	ICP-MS	3.63	4.13	1.68	0.687	2.81

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

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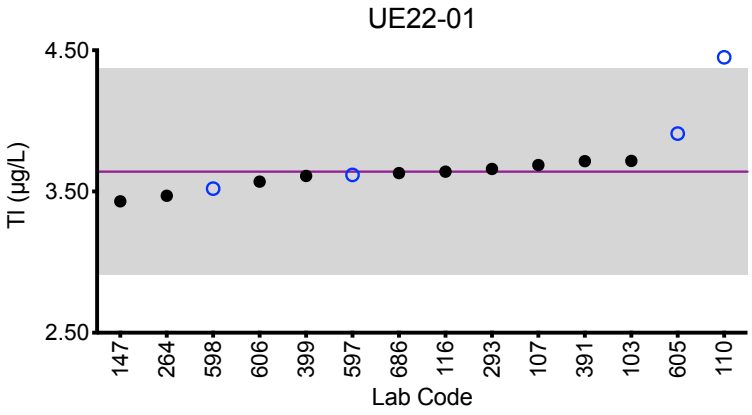
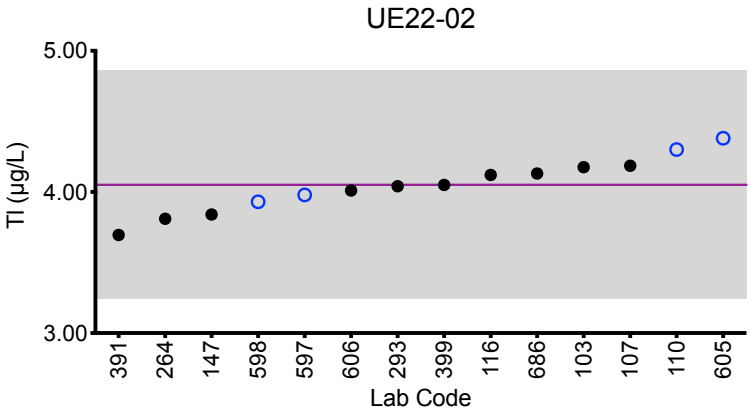
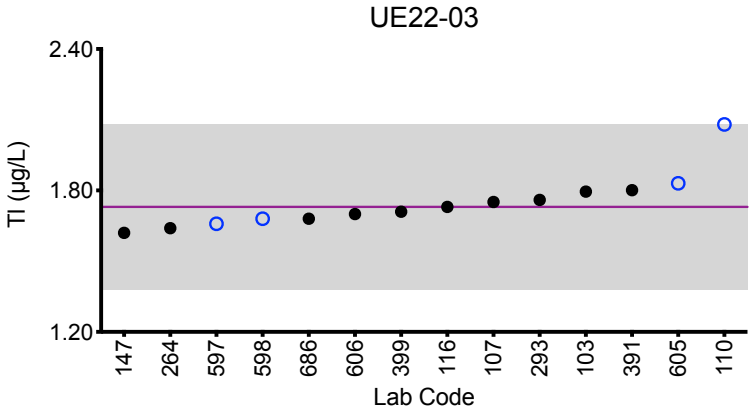
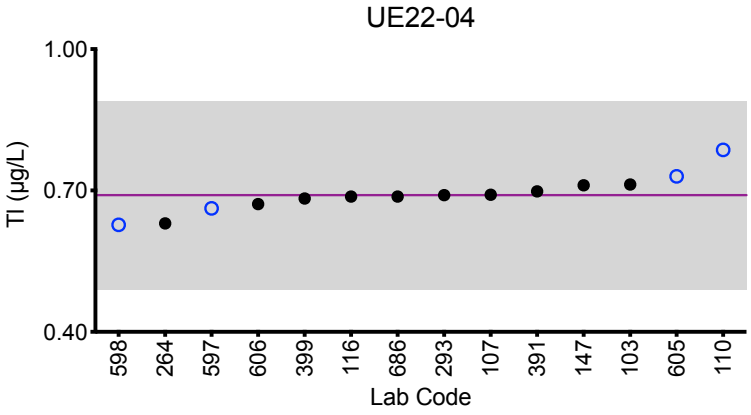
Results for Event #1, 2022: Summary Figures

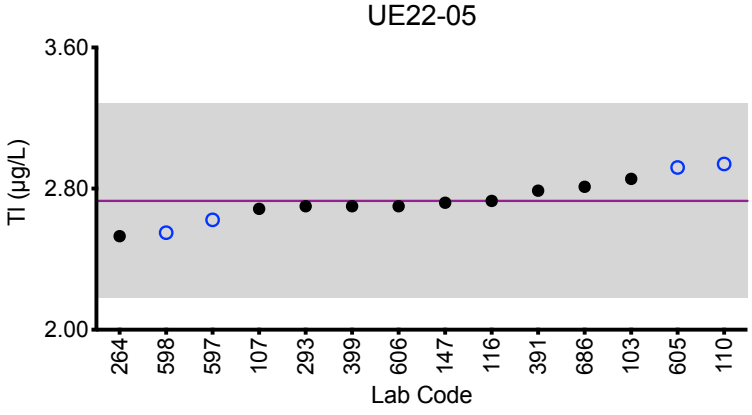
Urine Tl











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 #1, 2022: Summary Statistics

	Urine U (µg/L)				
	UE22-01	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
Target (Robust Mean (x*))	0.039	0.241	0.314	0.151	0.193
Upper Limit	0.069	0.289	0.377	0.181	0.232
Lower Limit	0.009	0.193	0.251	0.121	0.154
Robust SD (s*)	0.003	0.018	0.026	0.010	0.010
Robust RSD (%)	8.5	7.5	8.3	6.6	5.2
Number of Sample Measurements (N)	13	14	14	14	14
Standard Uncertainty (*u*)	0.001	0.006	0.009	0.003	0.003

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 #1, 2022:
Performance of Participating Laboratories

Urine U (µg/L)						
Lab Code	**Method**	**UE22-01**	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
	Target	**0.039**	**0.241**	**0.314**	**0.151**	**0.193**
103	ICP-MS/MS	0.0391	0.256	0.336	0.157	0.201
107	ICP-MS	0.0414	0.2596	0.3446	0.1625	0.2033
110	ICP-MS	0.042	0.255	0.330	0.166	0.205
116	ICP-MS/MS	0.0365	0.241	0.29	0.151	0.200
147	ICP-MS	0.0381	0.235	0.295	0.143	0.190
264	ICP-MS	0.04	0.18 ↓	0.25 ↓	0.14	0.17
324	ICP-MS	0.037	0.228	0.300	0.143	0.192
391	DRC/CC-ICP-MS	0.025	0.209	0.312	0.141	0.180
399	ICP-MS/MS	0.0320	0.218	0.297	0.143	0.188
597	ICP-MS/MS	<0.00695 ↓	0.249	0.346	0.158	0.194
598	ICP-MS	0.043	0.258	0.293	0.143	0.178
605	ICP-MS	0.040	0.256	0.341	0.160	0.203
606	ICP-MS/MS	0.041	0.236	0.314	0.154	0.198
686	ICP-MS	0.0389	0.247	0.320	0.155	0.194

Based on the grading criteria for U in Urine, 96% of results were satisfactory, with 1 of the 14 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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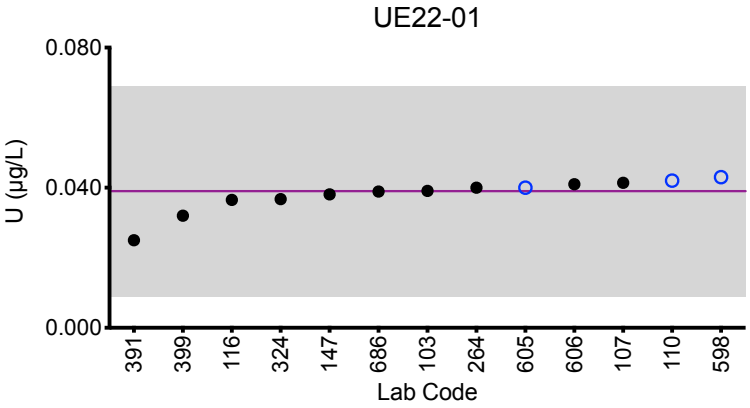
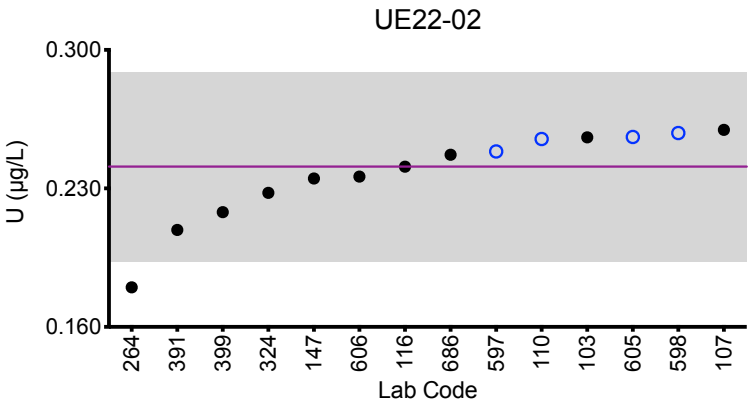
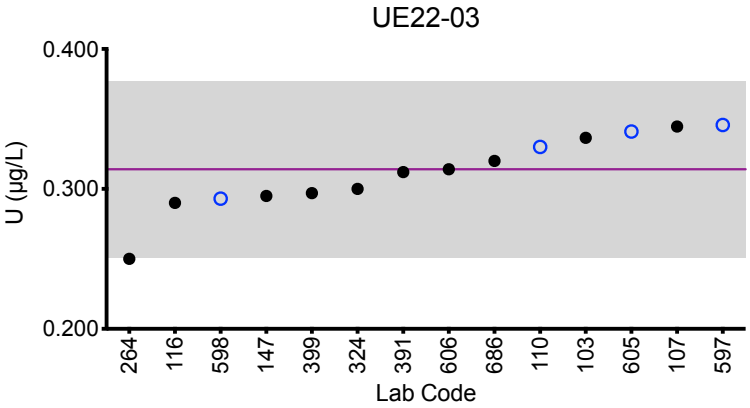
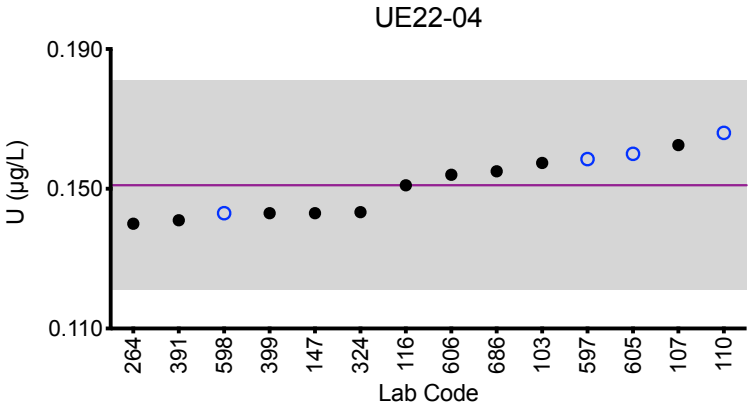
Results for Event #1, 2022: Summary Figures

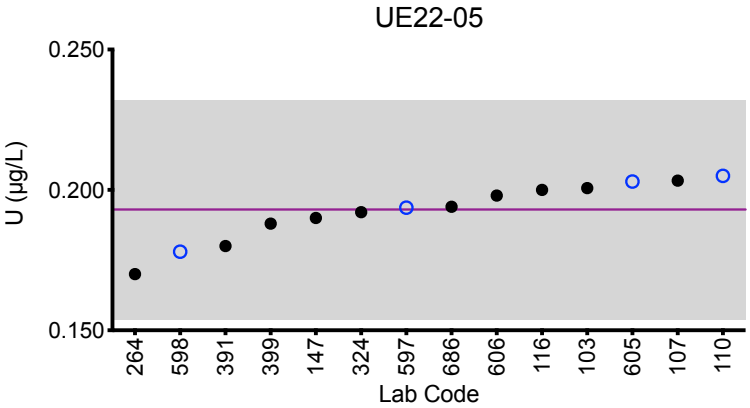
Urine U











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 #1, 2022:
Laboratory Data and Summary Statistics

Urine Al (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
147	ICP-MS	<9.44	12.8	20.9	12.5	14.0
264	ICP-MS	6.54	14.26	20.33	13.52	8.83
293	DRC/CC-ICP-MS	7.8	15.86	24.46	13.71	9.41
324	ICP-MS	8.090	14.802	19.377	16.555	11.949
597	ICP-MS/MS	<4.81	12.7	18.9	8.75	10.4

Summary Statistics

	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
Arithmetic Mean ($\bar{x}$)	7.5	14.1	21	13	10.9
Arithmetic SD (s)	0.8	1.3	2	3	2.1
Arithmetic RSD (%)	11	9.2	11	22	19
Number of Sample Measurements (N)	3	5	5	5	5

*Denotes a statistical Outlier.

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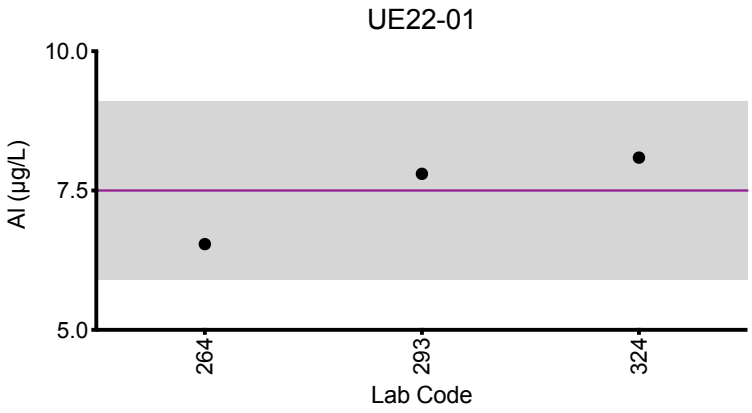
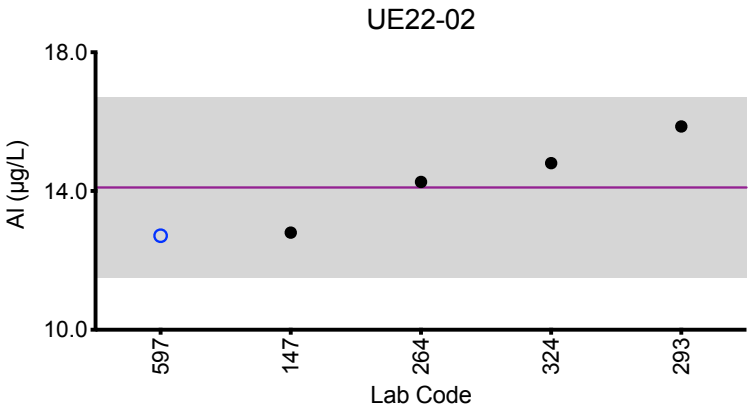
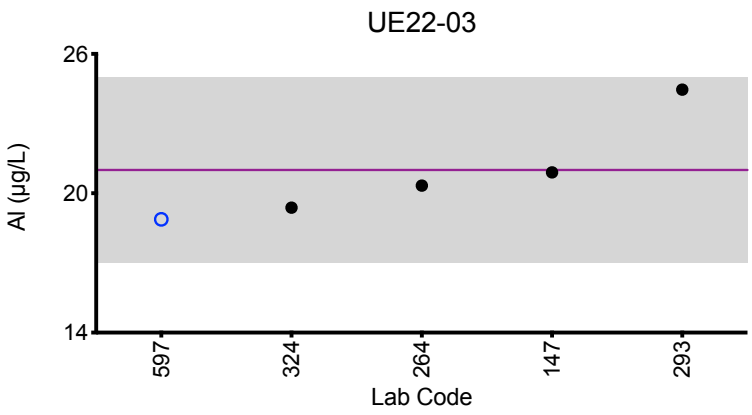
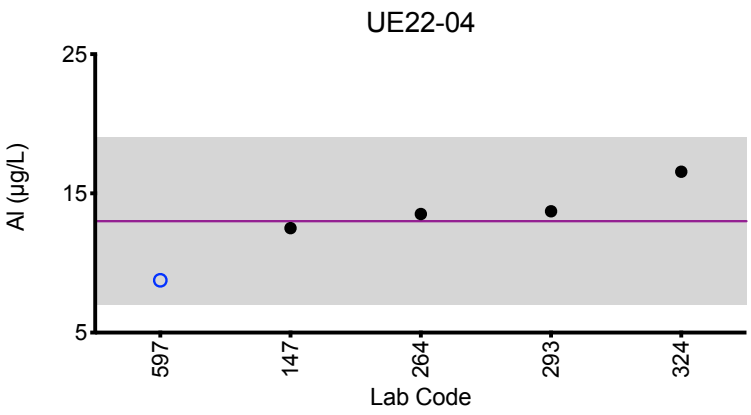
Results for Event #1, 2022: Summary Figures

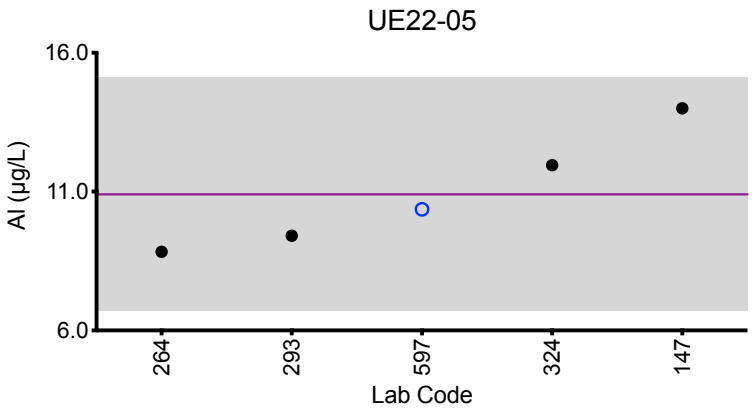
Urine Al











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 #1, 2022:
Laboratory Data and Summary Statistics

Urine Cs (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
107	ICP-MS	1.74	4.25	6.32	13.55	1.48
110	ICP-MS	1.63	4.12	6.01	13.6	1.42
147	ICP-MS	1.67	4.11	6.27	13.4	1.45
264	ICP-MS	*1.24	*3.05	*4.50	*9.86	*1.05
399	ICP-MS/MS	1.72	4.29	6.40	14.2	1.50
597	ICP-MS/MS	1.76	4.26	6.30	13.2	1.56
598	ICP-MS	1.7	4.2	6.31	13.6	1.46
605	ICP-MS	1.75	4.40	6.50	14.5	1.52
606	ICP-MS/MS	1.74	4.28	6.28	14.2	1.49

Summary Statistics

	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
Arithmetic Mean ($\bar{x}$)	1.71	4.24	6.30	13.8	1.48
Arithmetic SD (s)	0.05	0.10	0.14	0.5	0.04
Arithmetic RSD (%)	2.9	2.4	2.2	3.6	2.7
Number of Sample Measurements (N)	8	8	8	8	8

*Denotes a statistical Outlier.

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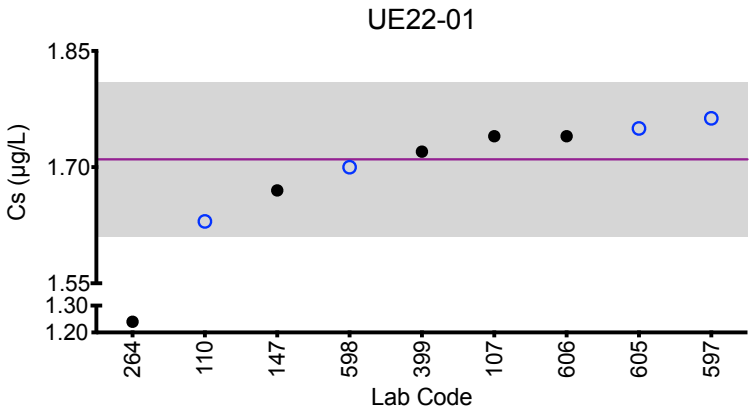
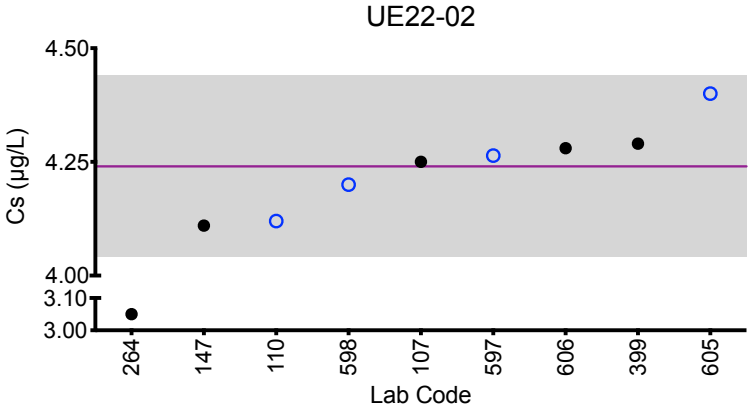
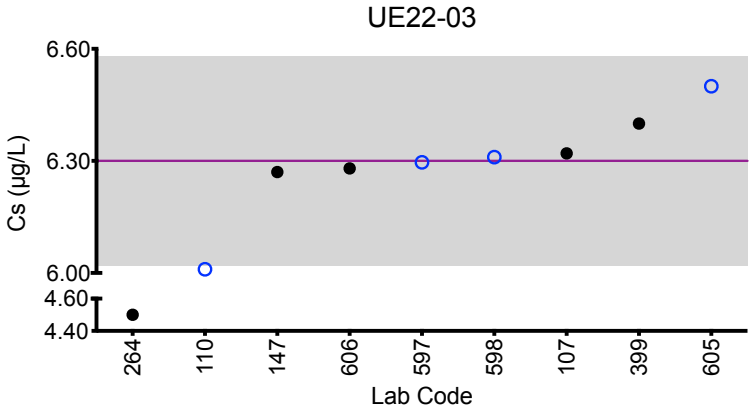
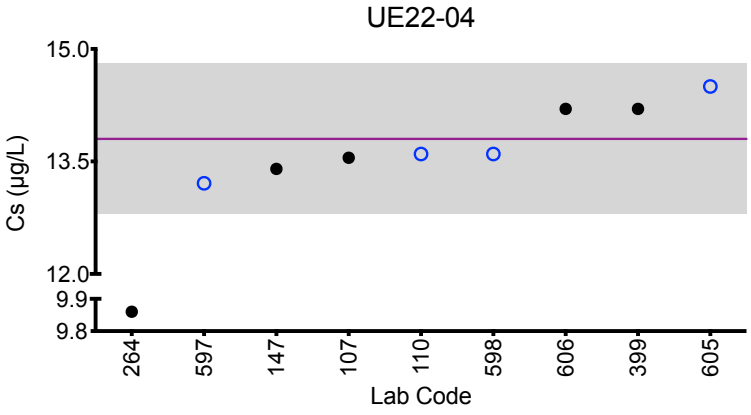
Results for Event #1, 2022: Summary Figures

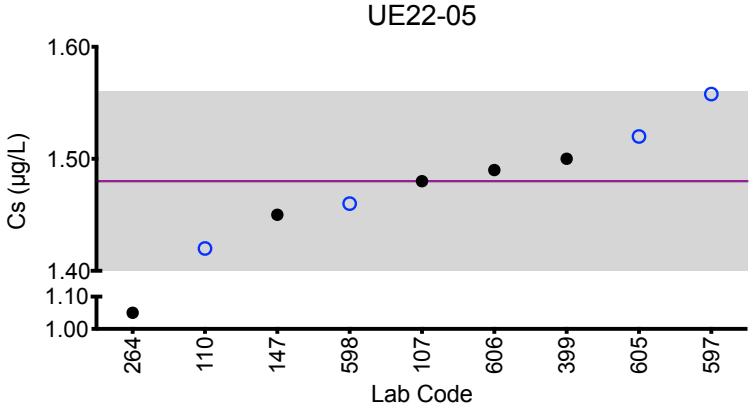
Urine Cs











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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Urine Cu (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
110	ICP-MS	80.0	17.1	115	43.8	89.0
116	ICP-MS/MS	66.0	12.0	102	38.7	82.8
147	ICP-MS	71.8	16.5	106	46.6	91.5
264	ICP-MS	62.60	11.80	99.27	36.85	78.77
293	DRC/CC-ICP-MS	61.03	11.44	98.54	35.6	76.92
324	ICP-MS	63.364	11.743	98.422	38.709	78.713
391	DRC/CC-ICP-MS	67.5	16.3	102	46.5	80.8
597	ICP-MS/MS	61.5	12.0	97.1	36.2	76.0
598	ICP-MS	58	11.7	93.1	34.3	72.3

Summary Statistics

	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
Arithmetic Mean ($\bar{x}$)	66	13.4	101	40	81
Arithmetic SD (s)	7	2.4	6	5	6
Arithmetic RSD (%)	11	18	5.9	13	7.4
Number of Sample Measurements (N)	9	9	9	9	9

*Denotes a statistical Outlier.

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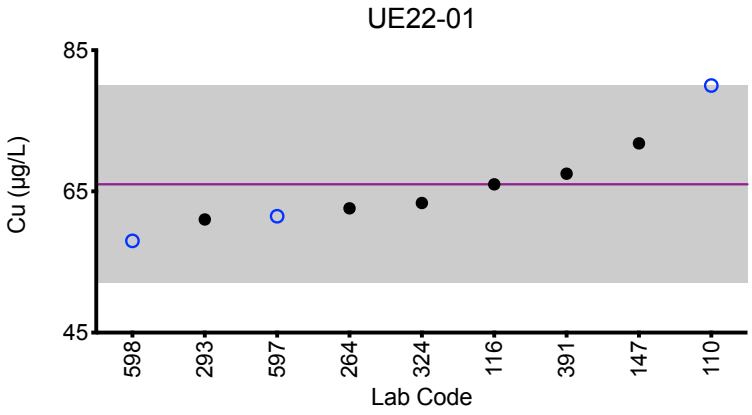
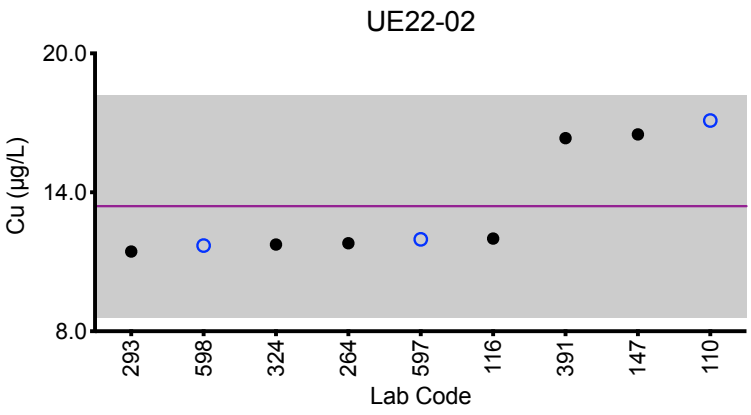
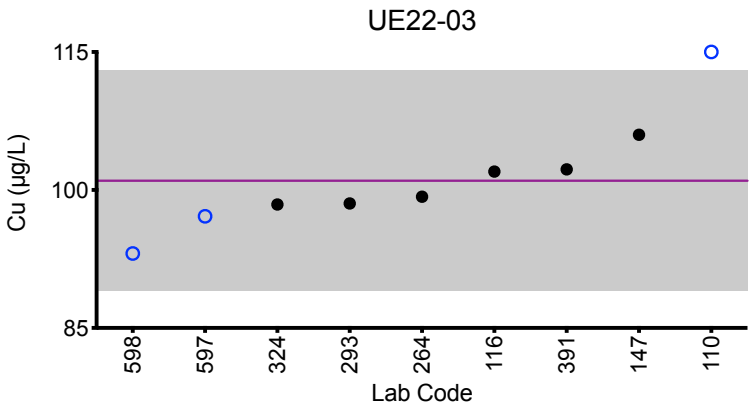
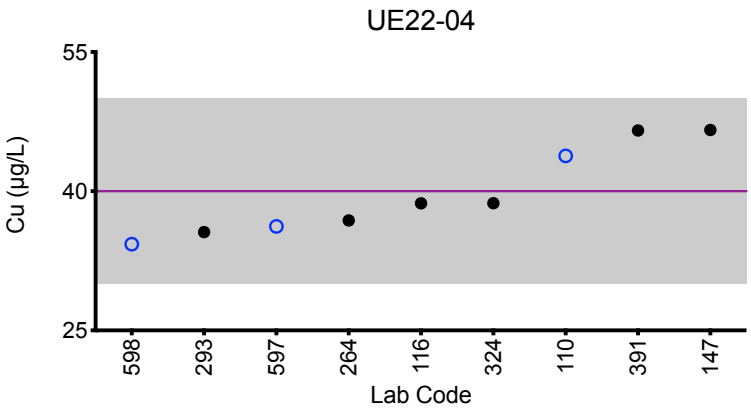
Results for Event #1, 2022: Summary Figures

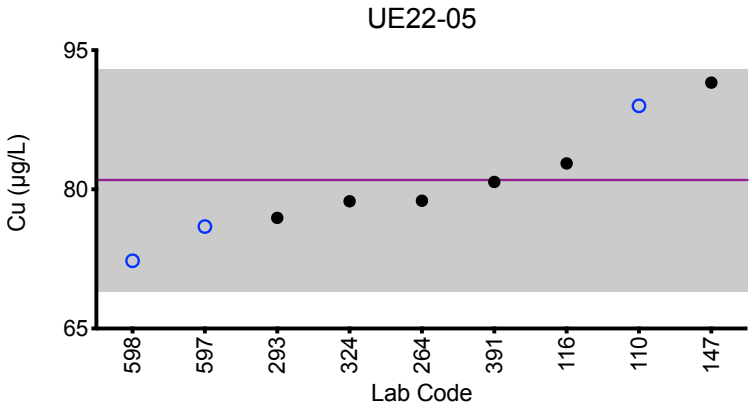
Urine Cu











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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Urine Mo (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
103	ICP-MS/MS	10.9	30.3	77.2	33.2	133
107	ICP-MS	10.98	31.90	76.78	34.14	134.46
110	ICP-MS	11.8	33.8	80.5	36.4	141
147	ICP-MS	10.4	29.2	69.8	32.1	127
264	ICP-MS	6.34	19.79	49.89	22.41	90.24
293	DRC/CC-ICP-MS	11.33	32.24	81.61	34.3	136.29
324	ICP-MS	10.865	30.913	77.842	32.803	132.157
399	ICP-MS/MS	11.3	32.1	79.2	34.7	138
597	ICP-MS/MS	10.2	29.1	71.9	30.9	123
598	DRC/CC-ICP-MS	11	31.5	73.2	34.3	142
605	ICP-MS	11.3	32.2	77.7	35.2	136
606	ICP-MS/MS	11.2	31.4	78.1	34.3	136

Summary Statistics

	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
Robust Mean (x*)	11.0	31.2	77	33.7	135
Robust SD (s*)	0.5	1.3	4	1.5	5
Robust RSD (%)	4.5	4.2	5.0	4.5	3.7
Number of Sample Measurements (N)	12	12	12	12	12
Standard Uncertainty (*u*)	0.2	0.5	1	0.5	2

*Denotes a statistical Outlier.

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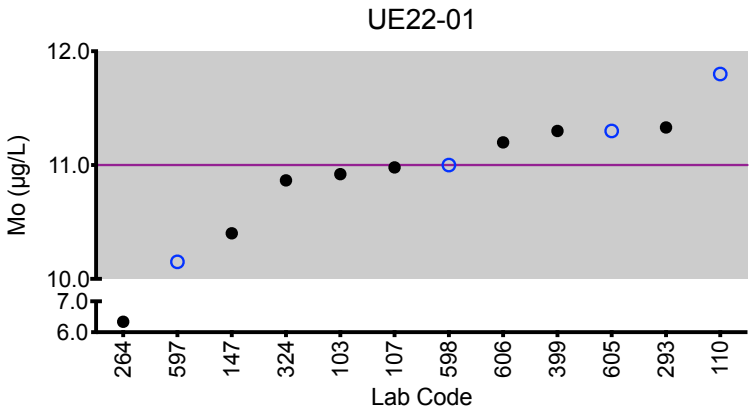
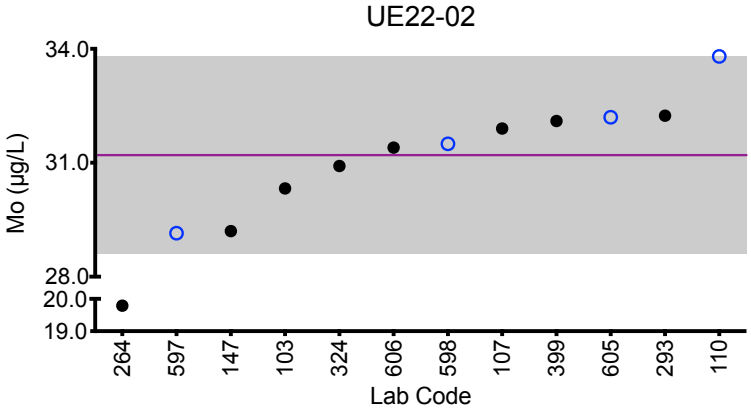
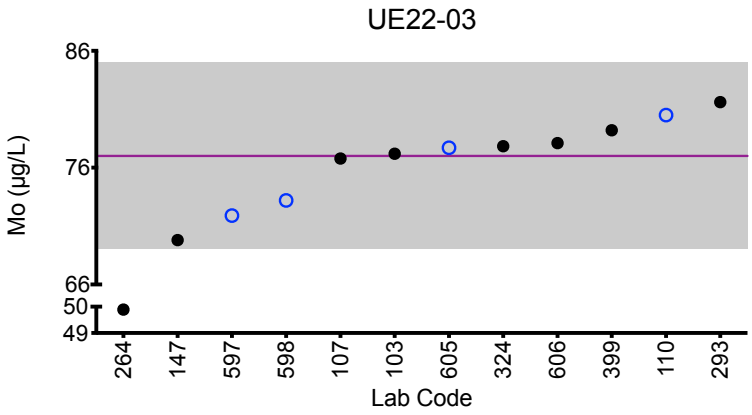
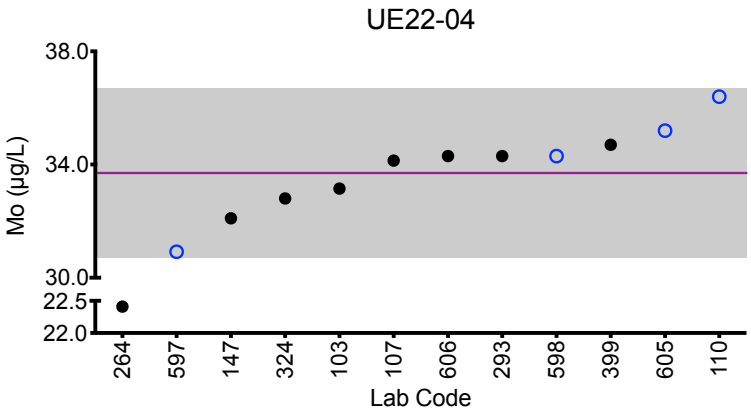
Results for Event #1, 2022: Summary Figures

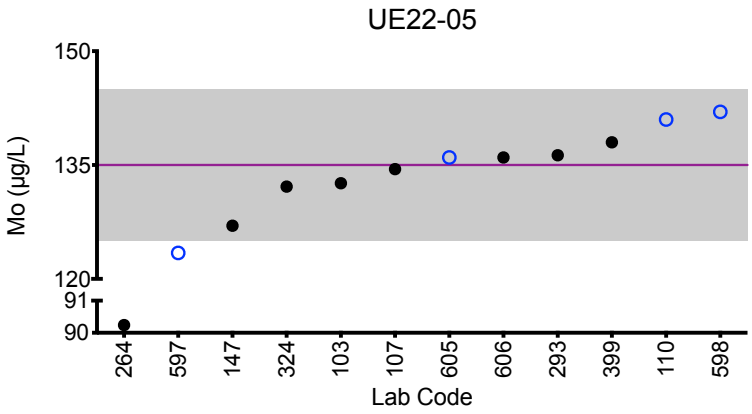
Urine Mo











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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Urine Ni (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
107	DRC/CC-ICP-MS	10.57	4.69	2.27	8.79	4.80
110	ICP-MS	12.0	5.75	3.00	10.1	6.02
147	ICP-MS	11.5	4.98	2.58	8.75	8.22
264	ICP-MS	10.12	4.50	2.32	8.21	4.54
293	DRC/CC-ICP-MS	11.14	4.7	2.41	8.4	4.6
324	ICP-MS	10.566	4.814	2.583	8.413	5.010
391	DRC/CC-ICP-MS	13.9	11.4	10.3	13.7	12.0
442	DRC/CC-ICP-MS	11.0	4.83	2.43	8.57	5.97
597	ICP-MS/MS	9.70	4.31	2.09	7.91	4.08
598	ICP-MS	10.5	5.09	2.6	9.07	5.16
605	ICP-MS	11.2	4.93	2.54	8.46	4.58

Summary Statistics

	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
Robust Mean (x*)	11.0	4.9	2.51	8.6	5.2
Robust SD (s*)	0.8	0.3	0.23	0.4	0.8
Robust RSD (%)	7.3	5.6	9.2	4.5	15
Number of Sample Measurements (N)	11	11	11	11	11
Standard Uncertainty (*u*)	0.3	0.1	0.09	0.1	0.3

*Denotes a statistical Outlier.

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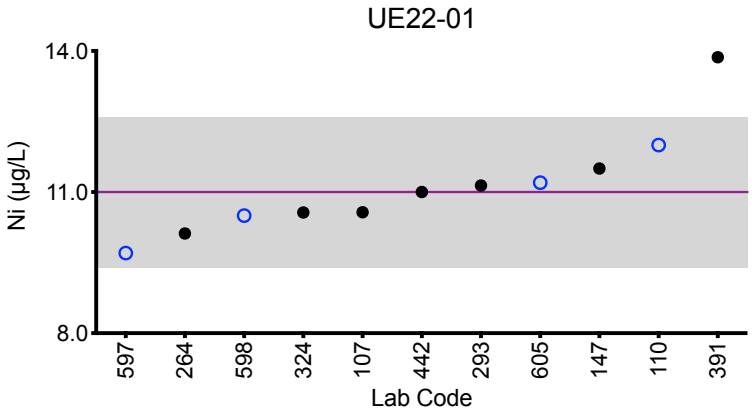
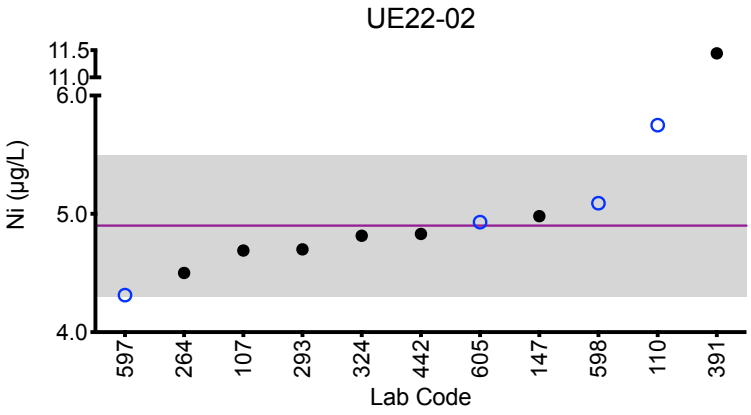
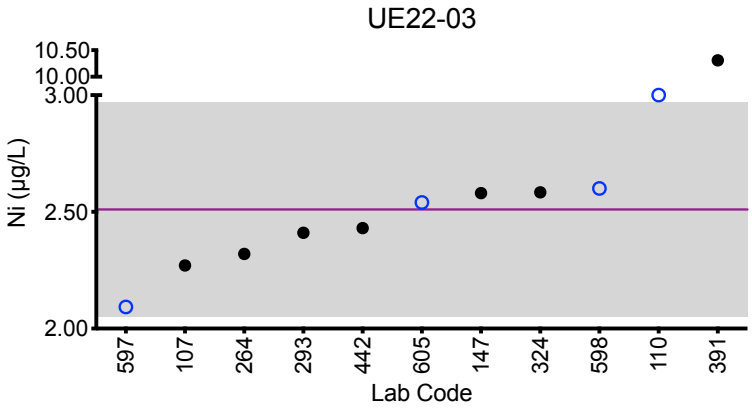
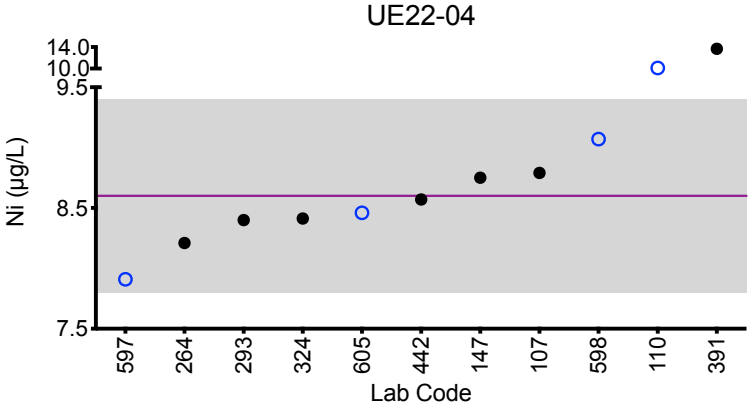
Results for Event #1, 2022: Summary Figures

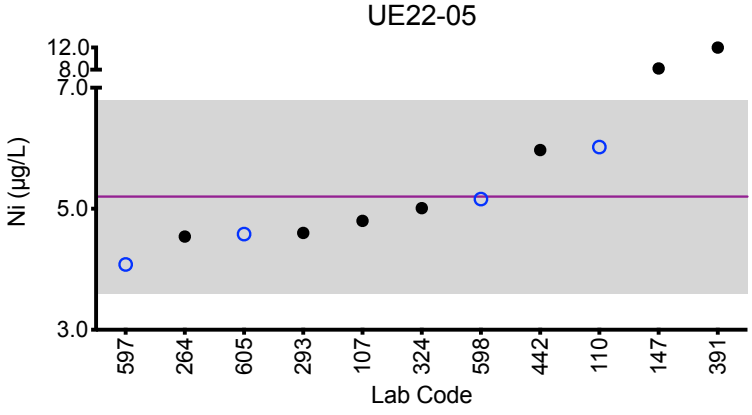
Urine Ni











Legend:

o C/HHEAR Labs ● Other Labs

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Gray area = ±2SD of the mean.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Urine Pt (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
107	ICP-MS	0.6889	2.1022	0.3756	1.1195	3.2464
110	ICP-MS	0.703	2.16	0.394	1.15	3.34
264	ICP-MS	0.62	1.89	0.35	1.03	2.93
293	DRC/CC-ICP-MS	0.68	2	0.36	1.05	3.08
399	ICP-MS/MS	0.676	2.08	0.359	1.11	3.16
598	ICP-MS	0.747	2.01	0.422	1.13	3.17
605	ICP-MS	0.665	2.05	0.369	1.09	3.19

Summary Statistics

	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
Arithmetic Mean ($\bar{x}$)	0.68	2.04	0.376	1.10	3.16
Arithmetic SD (s)	0.04	0.09	0.025	0.04	0.13
Arithmetic RSD (%)	5.6	4.4	6.6	3.6	4.1
Number of Sample Measurements (N)	7	7	7	7	7

*Denotes a statistical Outlier.

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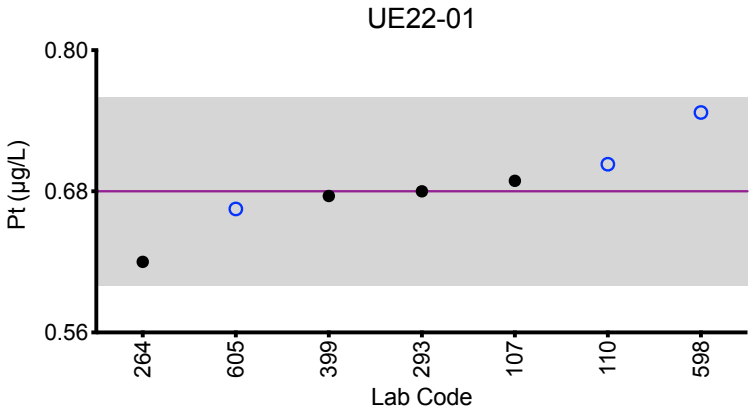
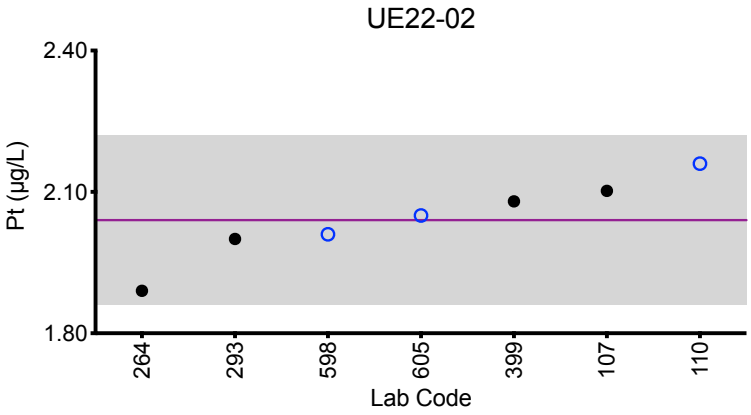
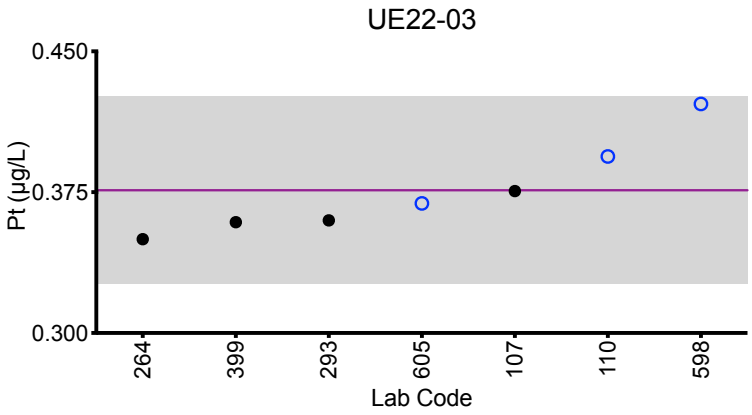
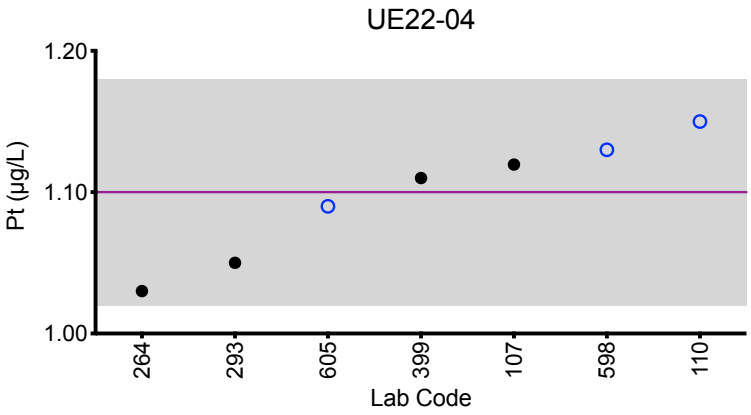
Results for Event #1, 2022: Summary Figures

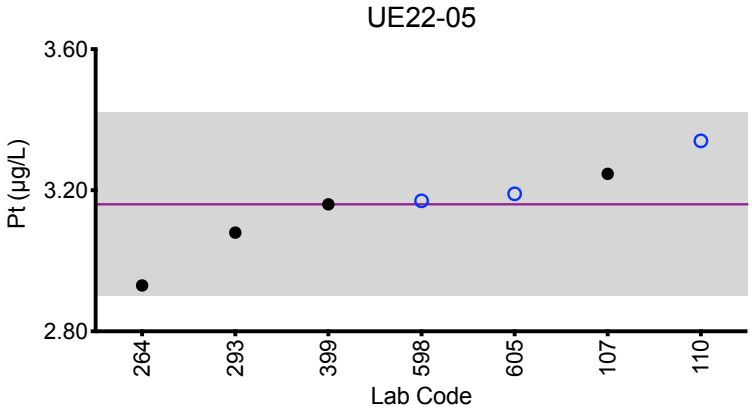
Urine Pt











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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Urine Sb (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
103	ICP-MS/MS	0.213	2.23	0.991	0.800	0.526
107	ICP-MS	0.245	2.323	1.026	0.814	0.517
110	ICP-MS	0.218	2.33	0.977	0.800	0.577
147	ICP-MS	0.246	2.54	1.12	0.928	0.603
264	ICP-MS	0.11	1.32	0.59	0.49	0.31
293	DRC/CC-ICP-MS	0.27	2.45	1.1	0.8	0.57
399	ICP-MS/MS	0.226	2.46	1.08	0.884	0.520
597	ICP-MS/MS	0.286	2.36	1.08	0.836	0.582
598	ICP-MS	0.221	2.3	1.06	0.843	0.526
605	ICP-MS	<0.8	2.51	1.10	0.883	<0.8
606	ICP-MS/MS	0.230	2.26	1.04	0.837	0.559

Summary Statistics

	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
Robust Mean (x*)	0.23	2.36	1.05	0.83	0.55
Robust SD (s*)	0.03	0.14	0.06	0.05	0.04
Robust RSD (%)	11	5.9	5.7	6.0	7.3
Number of Sample Measurements (N)	10	11	11	11	10
Standard Uncertainty (*u*)	0.01	0.05	0.02	0.02	0.02

*Denotes a statistical Outlier.

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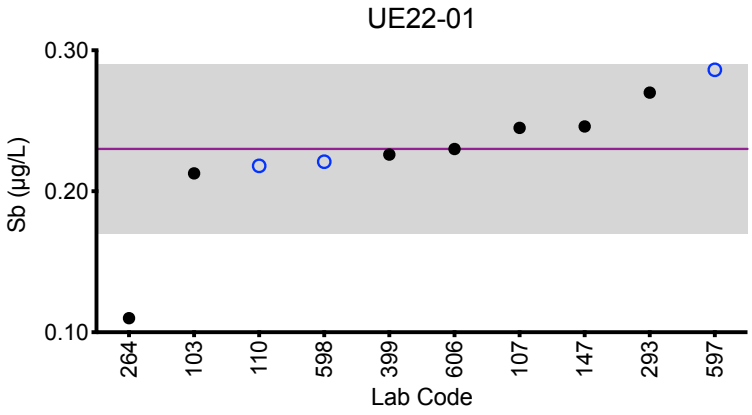
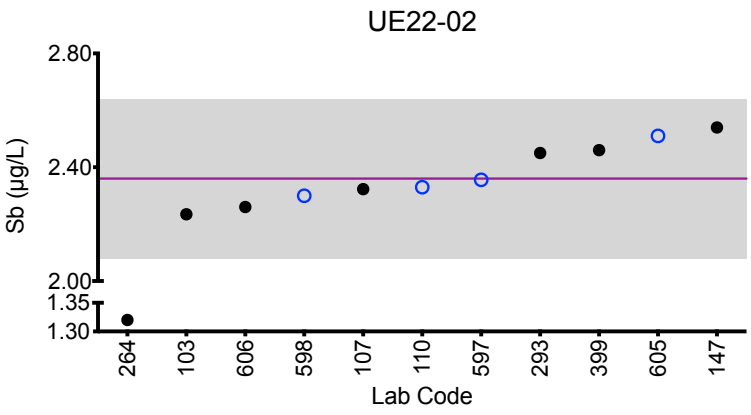
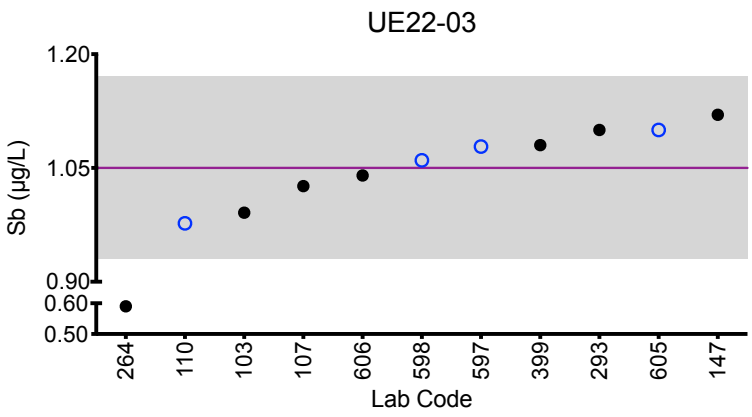
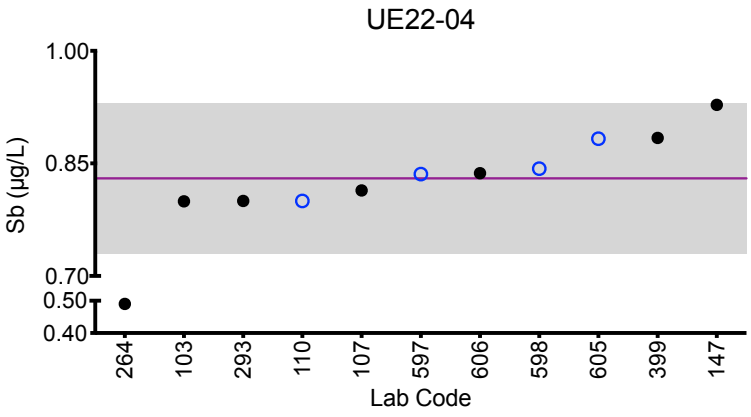
Results for Event #1, 2022: Summary Figures

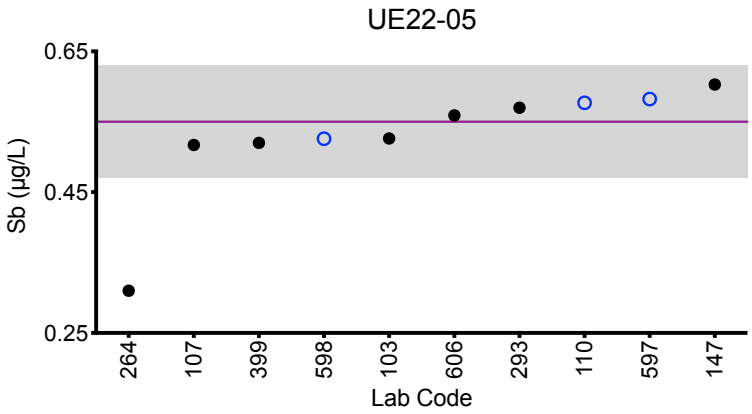
Urine Sb











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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Urine Se (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
103	ICP-MS/MS	261	30.4	174	107	24.7
110	DRC/CC-ICP-MS	293	37.4	184	132	30.9
147	ICP-MS	258	32.5	175	115	27.2
293	DRC/CC-ICP-MS	223.36	29.99	146.01	105.76	23.68
597	ICP-MS/MS	231	31.1	157	107	25.5
598	DRC/CC-ICP-MS	252	30	153	110	23.8

Summary Statistics

	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
Arithmetic Mean ($\bar{x}$)	253	32	165	113	26
Arithmetic SD (s)	25	3	15	10	3
Arithmetic RSD (%)	9.9	9.1	9.1	8.8	10
Number of Sample Measurements (N)	6	6	6	6	6

*Denotes a statistical Outlier.

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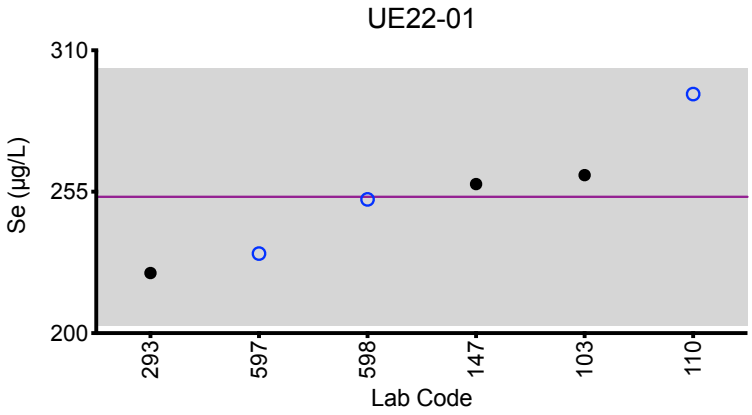
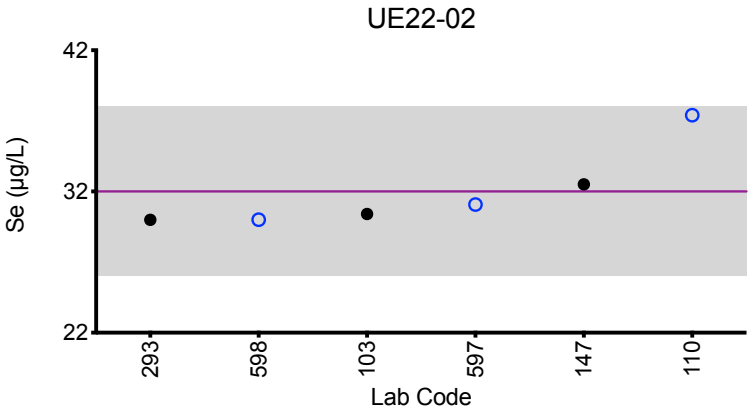
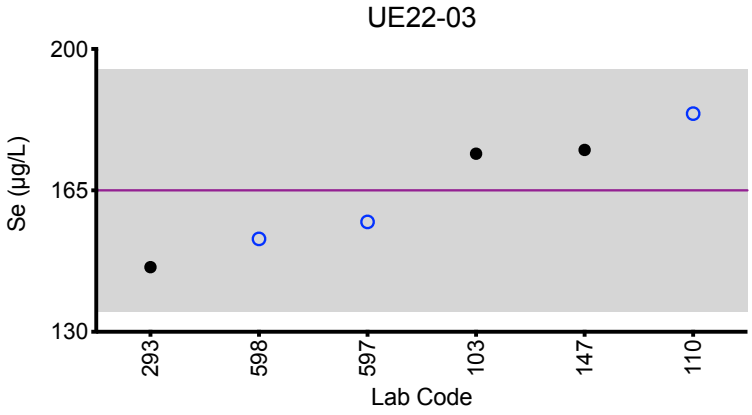
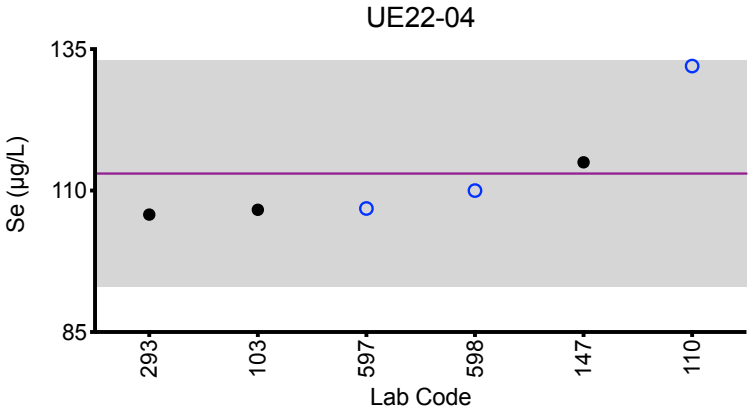
Results for Event #1, 2022: Summary Figures

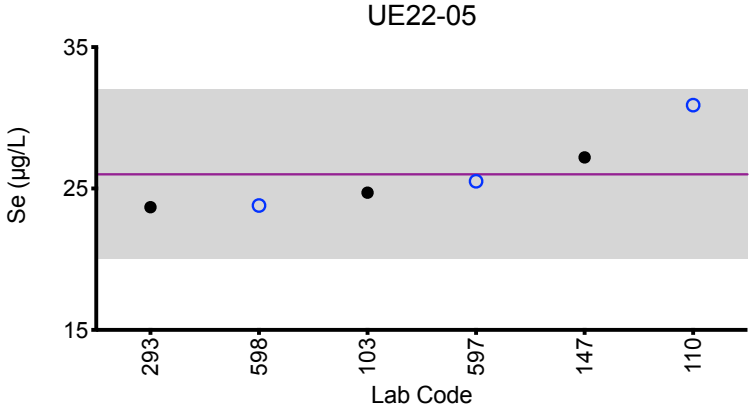
Urine Se











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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Urine Sn (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
107	ICP-MS	1.47	0.67	0.23	2.30	5.04
110	ICP-MS	1.30	0.68	<0.21	2.44	5.03
147	ICP-MS	1.07	0.588	<0.238	1.85	4.01
264	ICP-MS	*0.37	*0.14	*0.01	*0.59	*1.51
399	ICP-MS/MS	1.41	0.638	<0.300	2.44	5.55
597	ICP-MS/MS	1.14	0.617	0.273	1.88	3.90
598	ICP-MS	1.08	0.52	0.186	1.87	4.22
605	ICP-MS	1.06	<0.9	<0.9	1.89	4.34

Summary Statistics

	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
Arithmetic Mean ($\bar{x}$)	1.22	0.62	0.23	2.1	4.6
Arithmetic SD (s)	0.17	0.06	0.04	0.3	0.6
Arithmetic RSD (%)	14	9.7	17	13	13
Number of Sample Measurements (N)	7	6	3	7	7

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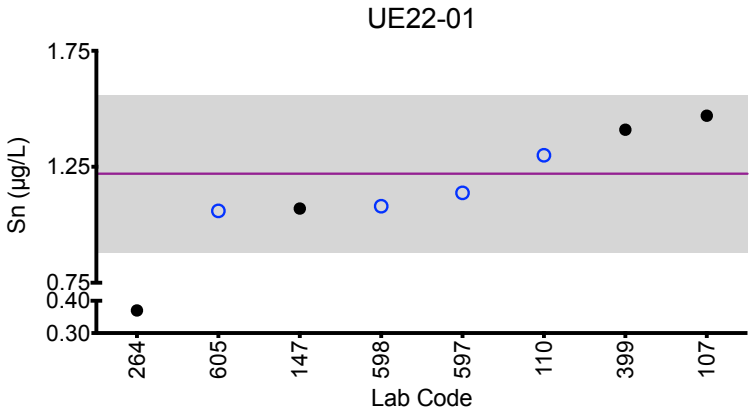
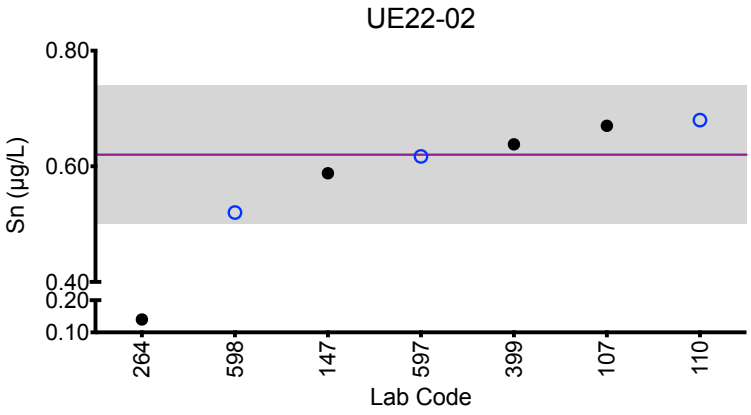
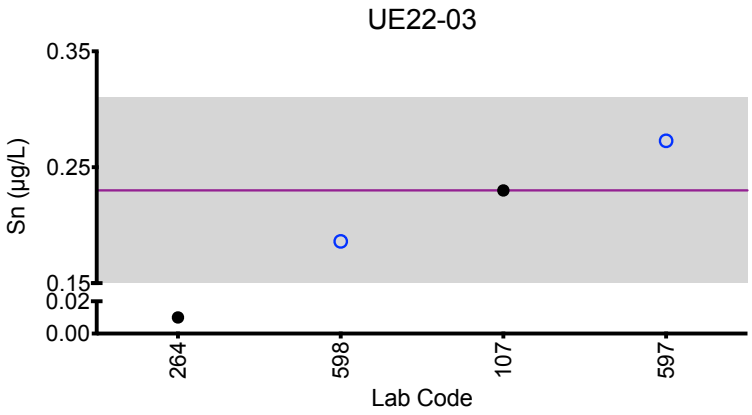
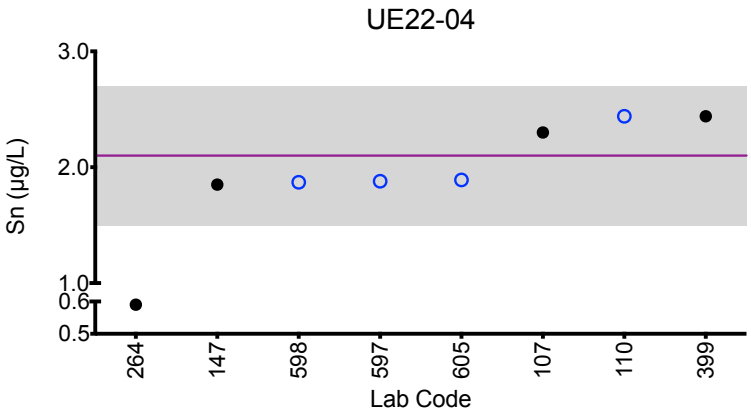
Results for Event #1, 2022: Summary Figures

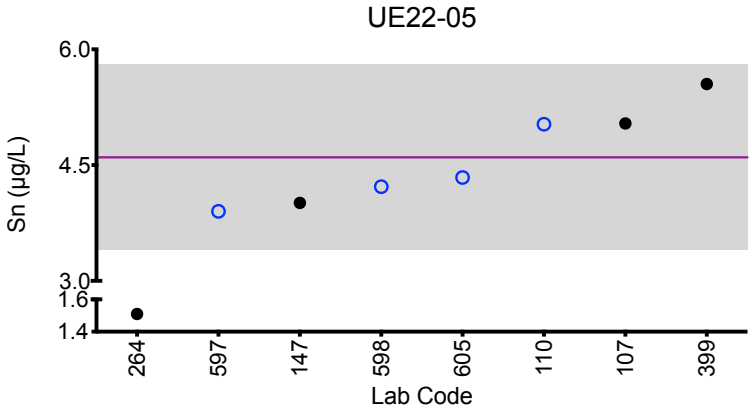
Urine Sn











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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Urine Sr (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
103	ICP-MS/MS	241	63.0	160	118	60.7
107	ICP-MS	251.6	65.2	163.8	124.4	63.6
200	ICP-MS	258	67	168	139	67
264	ICP-MS	207.53	*43.58	*110.06	82.16	*42.11
399	DRC/CC-ICP-MS	255	65.9	165	129	64.4
597	ICP-MS/MS	227	59.5	155	113	59.4
605	ICP-MS	251	67.0	167	129	65.3

Summary Statistics

	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
Arithmetic Mean ($\bar{x}$)	242	65	163	119	63
Arithmetic SD (s)	18	3	5	18	3
Arithmetic RSD (%)	7.4	4.5	3.1	15	4.6
Number of Sample Measurements (N)	7	6	6	7	6

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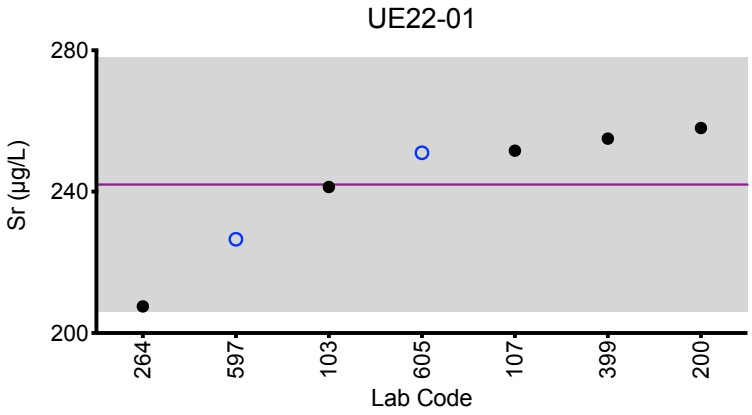
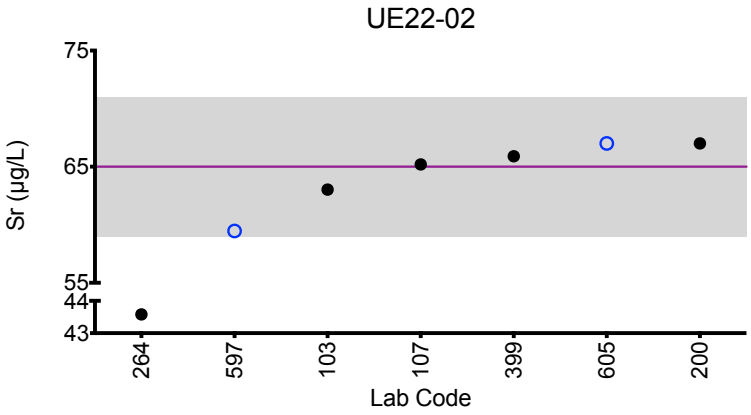
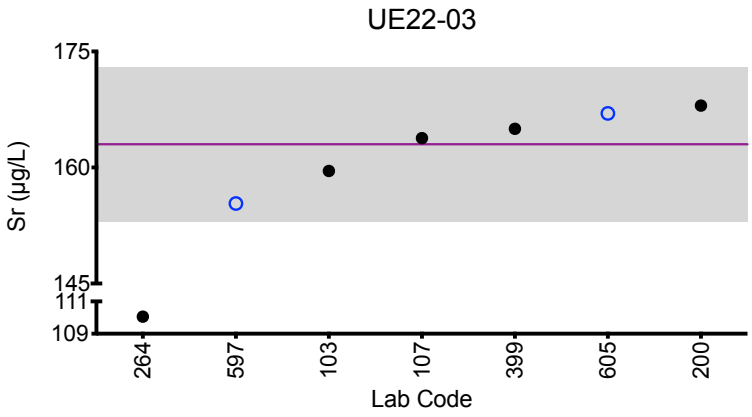
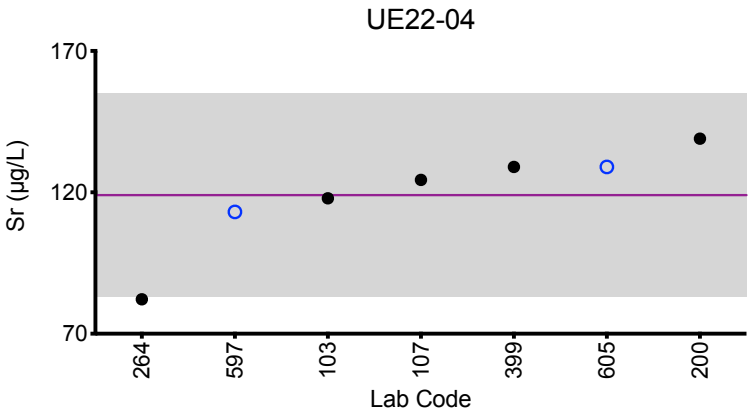
Results for Event #1, 2022: Summary Figures

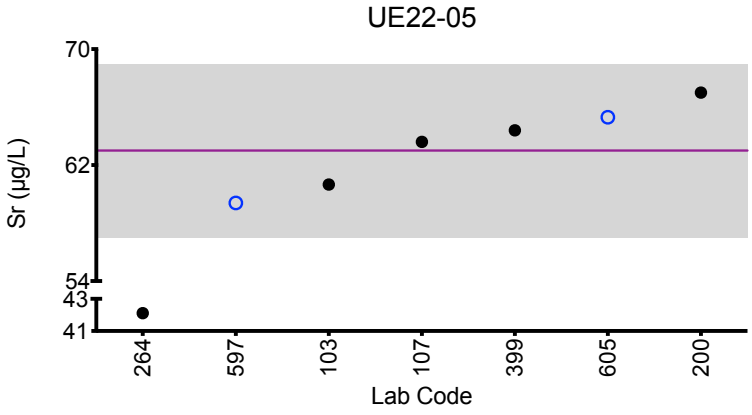
Urine Sr











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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Urine V (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
116	ICP-MS/MS	0.399	<0.100	0.290	0.636	0.156
147	DRC/CC-ICP-MS	0.402	<0.0612	0.267	0.602	0.170
293	DRC/CC-ICP-MS	0.52	0.23	0.34	0.77	0.3
597	ICP-MS/MS	0.370	<0.0844	0.160	0.407	<0.0844
598	DRC/CC-ICP-MS	0.434	<0.2	0.247	0.726	0.207
605	ICP-MS	0.381	<0.3	<0.3	0.799	<0.3

Summary Statistics

	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
Arithmetic Mean ($\bar{x}$)	0.42	NA	0.26	0.66	0.21
Arithmetic SD (s)	0.05	NA	0.07	0.14	0.06
Arithmetic RSD (%)	12	NA	27	21	29
Number of Sample Measurements (N)	6	NA	5	6	4

*Denotes a statistical Outlier.

Statistical data was not calculated for UE22-02 based on a lack of consensus among participating labs.

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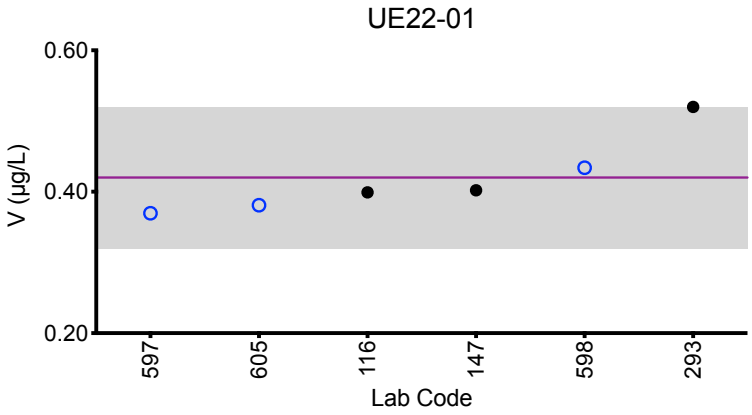
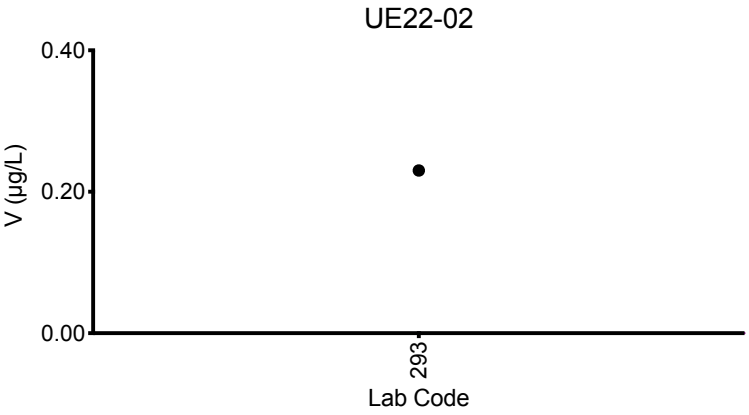
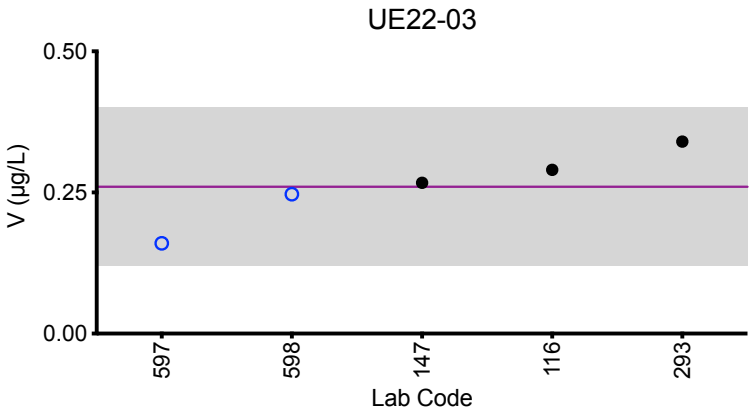
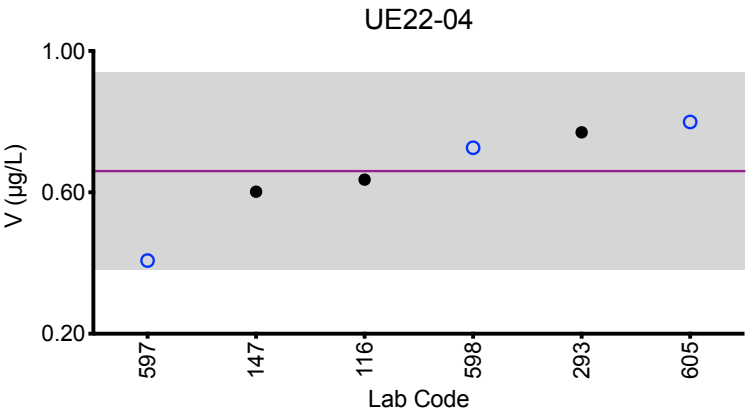
Results for Event #1, 2022: Summary Figures

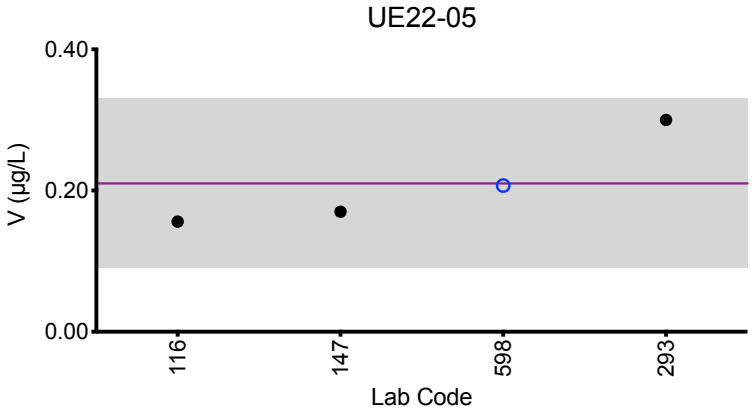
Urine V











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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Urine W (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
107	ICP-MS	1.651	0.554	1.288	0.766	0.396
110	ICP-MS	1.76	0.577	1.35	0.797	0.423
147	ICP-MS	1.64	0.541	1.26	0.765	0.458
200	ICP-MS	1.60	0.55	1.18	0.86	0.46
264	ICP-MS	1.46	0.46	1.14	0.64	0.32
324	ICP-MS	1.643	<1	1.303	<1	<1
399	ICP-MS/MS	1.71	0.538	1.32	0.740	0.399
597	ICP-MS/MS	1.59	0.528	1.27	0.797	0.380
598	ICP-MS	1.79	0.597	1.4	0.779	0.468
605	ICP-MS	1.72	0.583	1.36	0.795	0.420
606	ICP-MS/MS	1.68	0.568	1.30	0.774	0.430

Summary Statistics

	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
Robust Mean (x*)	1.67	0.55	1.30	0.78	0.42
Robust SD (s*)	0.08	0.03	0.07	0.03	0.04
Robust RSD (%)	4.8	5.6	5.4	3.9	9.5
Number of Sample Measurements (N)	11	10	11	10	10
Standard Uncertainty (*u*)	0.03	0.01	0.02	0.01	0.02

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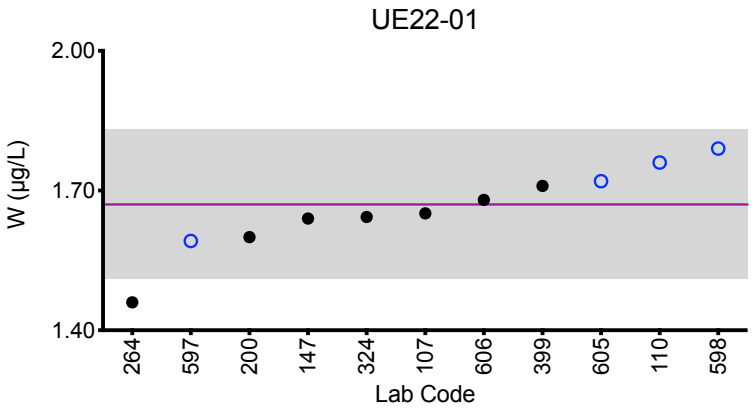
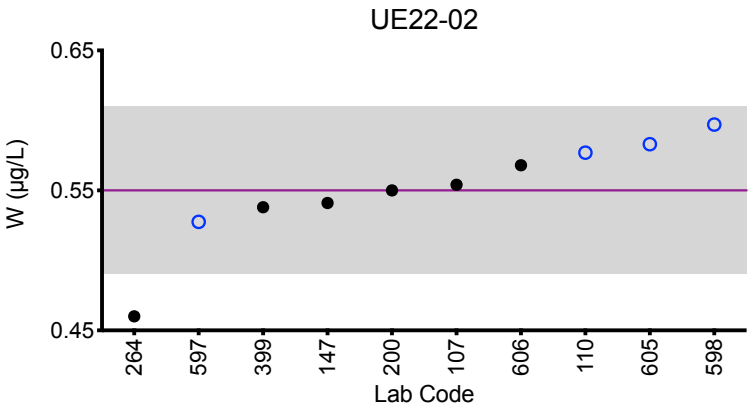
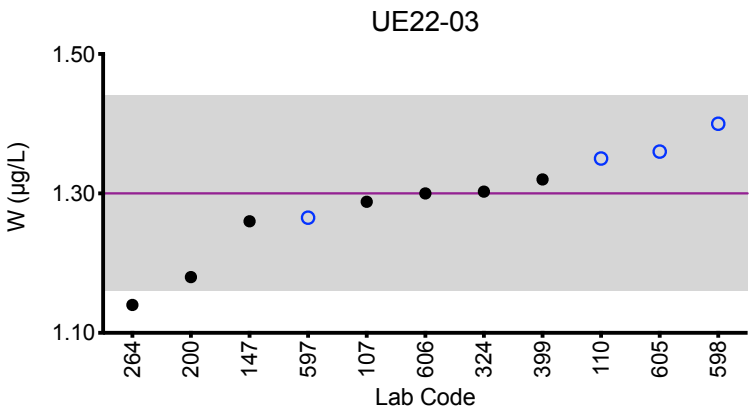
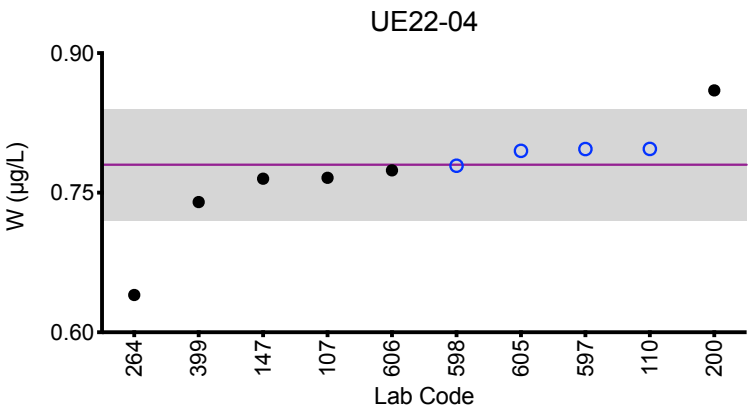
Results for Event #1, 2022: Summary Figures

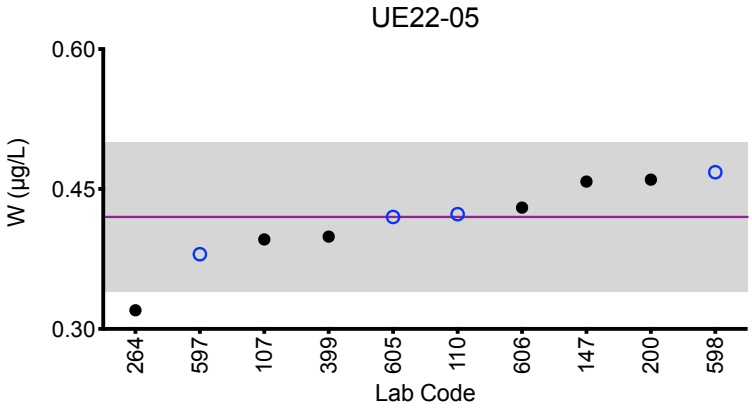
Urine W











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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Urine Zn (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
110	ICP-MS	250	209	128	354	233
147	ICP-MS	255	214	108	382	*284
264	ICP-MS	226.08	199.71	97.36	363.96	232.51
293	DRC/CC-ICP-MS	205.88	179.08	72.55	339.22	211.76
324	ICP-MS	219.049	192.318	89.811	370.480	229.353
391	DRC/CC-ICP-MS	199	187	100	356	221
597	ICP-MS/MS	210	188	86.9	353	218
598	ICP-MS	209	187	89.5	344	220

Summary Statistics

	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
Arithmetic Mean ($\bar{x}$)	222	194	97	358	224
Arithmetic SD (s)	21	12	16	14	8
Arithmetic RSD (%)	9.5	6.2	16	3.9	3.6
Number of Sample Measurements (N)	8	8	8	8	7

*Denotes a statistical Outlier.

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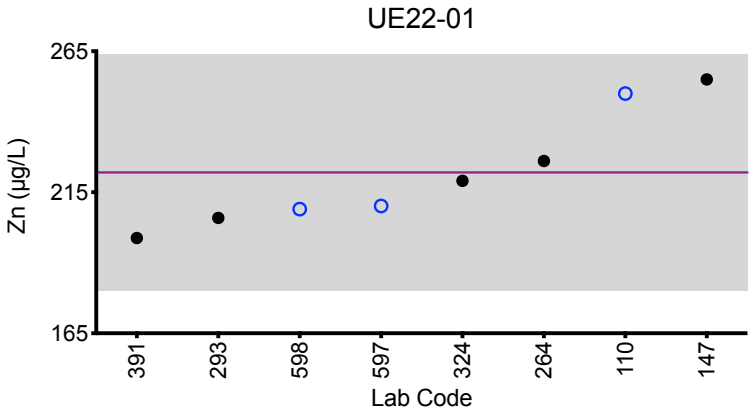
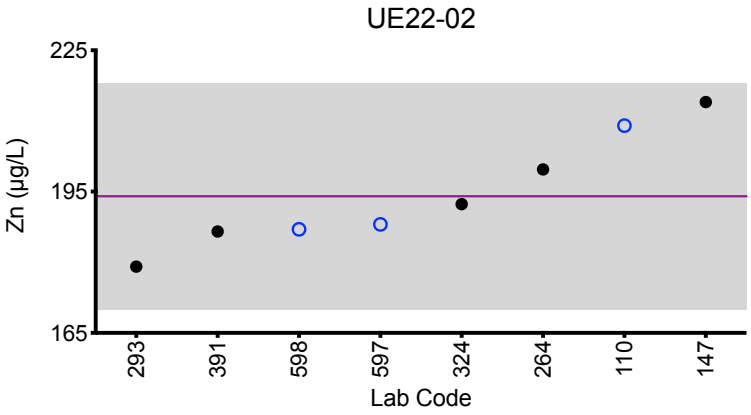
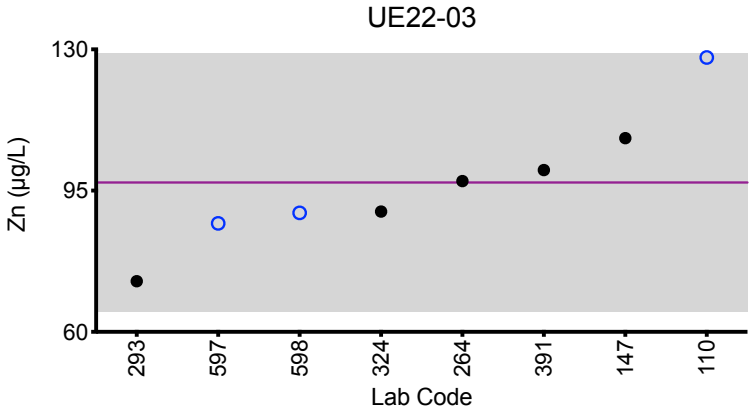
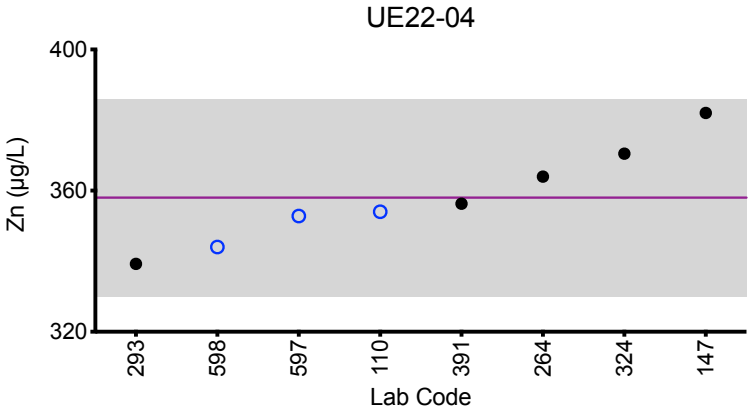
Results for Event #1, 2022: Summary Figures

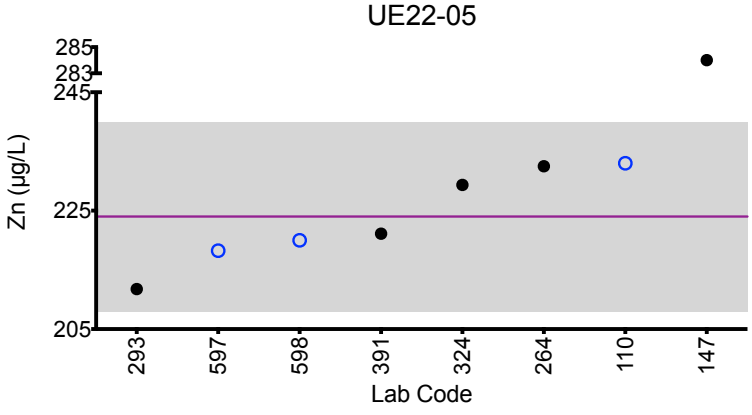
Urine Zn











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 #1, 2022:
Laboratory Data and Summary Statistics

Urine Te (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
110	ICP-MS	2.12	1.25	0.626	1.44	0.300
147	ICP-MS	2.63	1.36	0.775	1.59	0.385

Summary Statistics

	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
Arithmetic Mean ($\bar{x}$)	2.4	1.30	0.70	1.51	0.34
Arithmetic SD (s)	0.4	0.08	0.11	0.11	0.06
Arithmetic RSD (%)	17	6.2	16	7.3	18
Number of Sample Measurements (N)	2	2	2	2	2

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Urine Ti (µg/L)						
Lab Code	**Method**	**UE22-01**	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
442	DRC/CC-ICP-MS	2.11	6.66	7.43	1.74	2.72
597	ICP-MS/MS	<2.05	7.95	8.12	3.04	2.83
Summary Statistics						
		UE22-01	**UE22-02**	**UE22-03**	**UE22-04**	**UE22-05**
Arithmetic Mean ($\bar{x}$)		NA	7.3	7.8	NA	2.78
Arithmetic SD (s)		NA	0.9	0.5	NA	0.08
Arithmetic RSD (%)		NA	12	6.4	NA	2.9
Number of Sample Measurements (N)		NA	2	2	NA	2

*Denotes a statistical Outlier.

Statistical data was not calculated for UE22-01 and UE22-04 based on a lack of consensus among participating labs.

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Results for Event #1, 2022: Additional Elements in Urine

Urine Ag (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
147	ICP-MS	<0.183	<0.183	<0.183	<0.183	<0.183

Urine B (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
200	ICP-MS	338	374	188	806	609

Urine Bi (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
147	ICP-MS	<0.0815	<0.0815	<0.0815	<0.0815	<0.0815
264	ICP-MS	0.01	0.01	0.01	0.01	0.01
597	ICP-MS/MS	<0.0510	<0.0510	<0.0510	<0.0510	<0.0510

Urine Fe (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
324	ICP-MS	12.176	6.407	4.558	18.058	13.029

Urine I (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
147	ICP-MS	99.4	143	60.0	273	163

Urine Li (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
147	ICP-MS	6.37	12.7	3.37	26.4	10.5

Urine Mg (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
597	ICP-MS/MS	18400	22200	9710	43300	30000

Urine Th (µg/L)

Lab Code	Method	UE22-01	UE22-02	UE22-03	UE22-04	UE22-05
147	ICP-MS	<0.0673	<0.0673	<0.0673	<0.0673	<0.0673
597	ICP-MS/MS	<0.0298	0.0380	<0.0298	0.0482	<0.0298

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Event #1, 2022

Trace Elements in Serum

Wadsworth Center
NEW YORK STATE DEPARTMENT OF HEALTH
Trace Elements Laboratory

NEW YORK STATE | Department of Health | Wadsworth Center

Event #1, 2022:
Trace Elements in Serum

PT Materials

Test materials were prepared from human serum obtained from Zen-Bio, 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). 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 (a) the robust mean calculated from data reported by all laboratories, or (b) if a robust mean is not possible, the arithmetic mean after outlier deletion.

Additional Elements

An additional 26 were reported by at least one participant: As, B, Ba, Be, Bi, Cd, Cs, Fe, Hg, I, Li, Mg, Mn, Mo, Ni, Pb, Pt, Sb, Sn, Sr, 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 #1, 2022: Summary Statistics

	Serum Al (µg/L)				
	SE22-01	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
Target (Arithmetic Mean ($\bar{x}$))	93	30.5	68	37	54.6
Upper Limit	112	36.6	82	44	65.5
Lower Limit	74	24.4	54	30	43.7
Arithmetic SD (s)	7	1.9	4	2	1.6
Arithmetic RSD (%)	7.5	6.2	5.9	6.5	2.9
Number of Sample Measurements (N)	6	6	6	6	5

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

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Results for Event #1, 2022:
Performance of Participating Laboratories

		Serum Al (µg/L)				
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
	Target	**93**	**30.5**	**68**	**37**	**54.6**
147	ETAAS-Z	82.7	33.2	63.7	38.7	52.8
264	ICP-MS	99.27	30.92	74.01	38.46	*63.79
293	DRC/CC-ICP-MS	99.46	32.26	69.89	37.63	56.45
391	ETAAS-Z	86.4	29.0	64.8	37.8	55.4
485	HR-ICP-MS	97.00	28.2	68.3	35.7	55.4
597	ICP-MS/MS	90.4	29.6	65.3	32.4	53.1

Based on the grading criteria for Al in Serum, 100% of results were satisfactory, with 0 of the 6 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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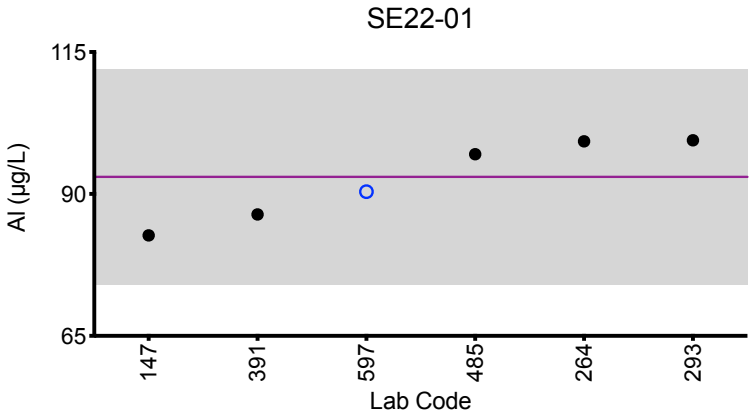
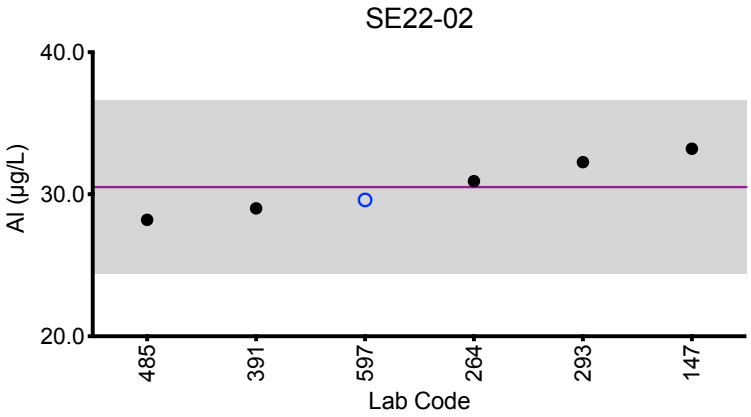
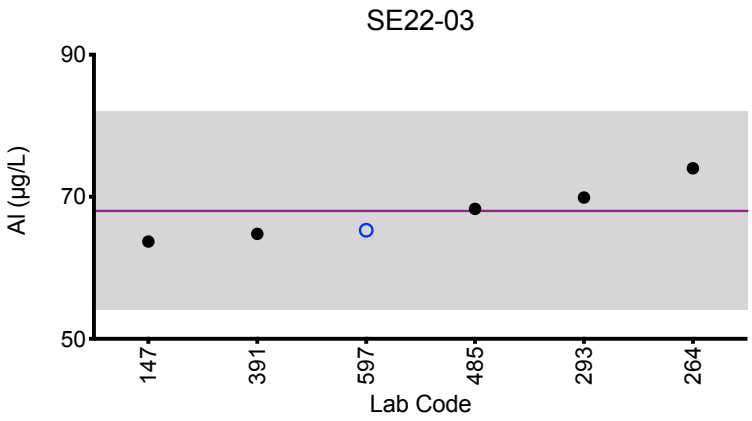
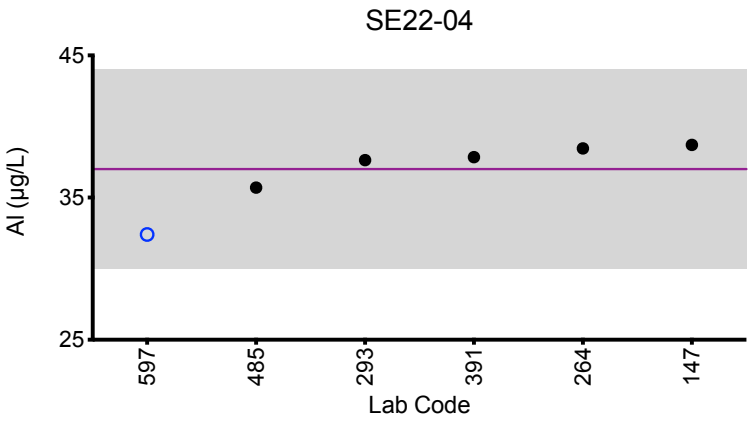
Results for Event #1, 2022: Summary Figures

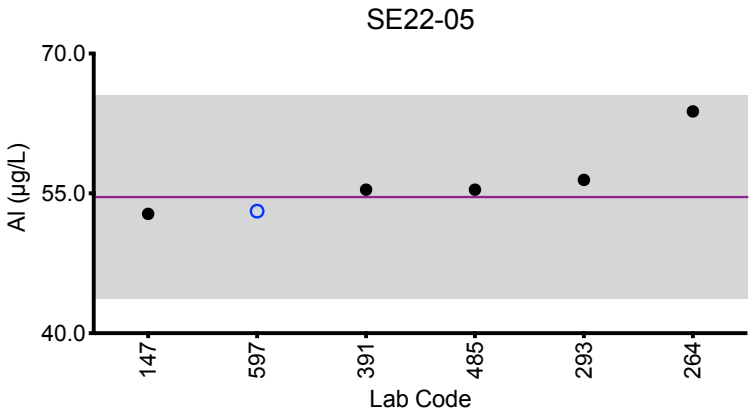
Serum Al











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 #1, 2022: Summary Statistics

	Serum Co (µg/L)				
	SE22-01	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
Target (Arithmetic Mean ($\bar{x}$))	61.1	9.9	5.3	4.02	1.60
Upper Limit	70.3	11.4	6.8	5.52	3.10
Lower Limit	51.9	8.4	3.8	2.52	0.10
Arithmetic SD (s)	1.1	0.6	0.3	0.20	0.07
Arithmetic RSD (%)	1.8	6.1	6.6	5.0	4.4
Number of Sample Measurements (N)	7	7	7	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 #1, 2022:
Performance of Participating Laboratories

Serum Co (µg/L)						
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
	Target	**61.1**	**9.9**	**5.3**	**4.02**	**1.60**
103	ICP-MS/MS	61.4	9.71	5.06	3.92	1.56
110	ICP-MS	63.1	10.3	5.82	4.32	1.65
147	DRC/CC-ICP-MS	61.2	8.72	4.77	3.67	1.47
264	ICP-MS	61.15	9.95	5.51	4.10	1.65
293	DRC/CC-ICP-MS	61.0	10.66	5.54	4.09	1.67
485	HR-ICP-MS	60.4	10.2	5.46	4.1	1.61
597	ICP-MS/MS	59.3	9.59	5.20	3.94	1.61

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

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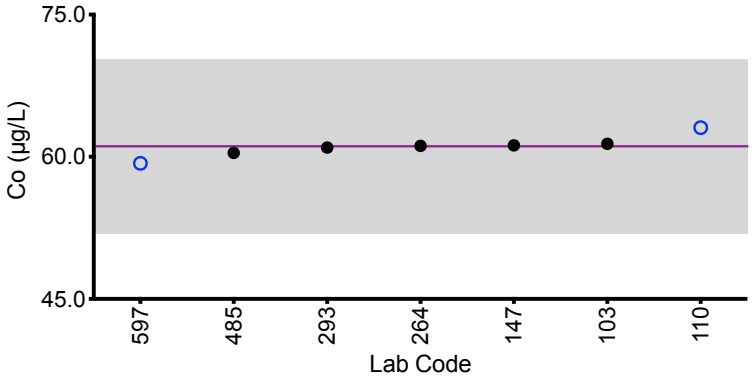
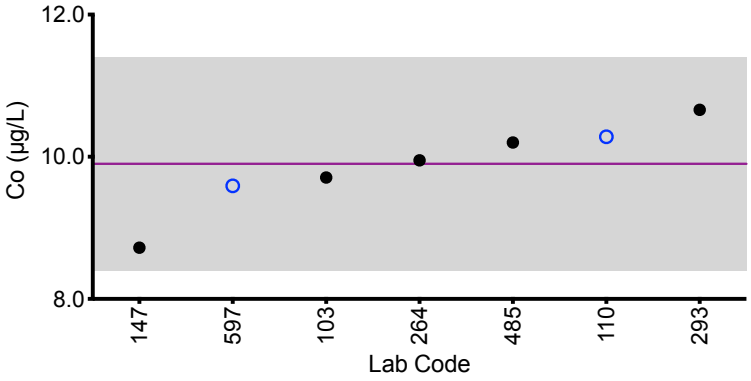
Results for Event #1, 2022: Summary Figures

Serum Co

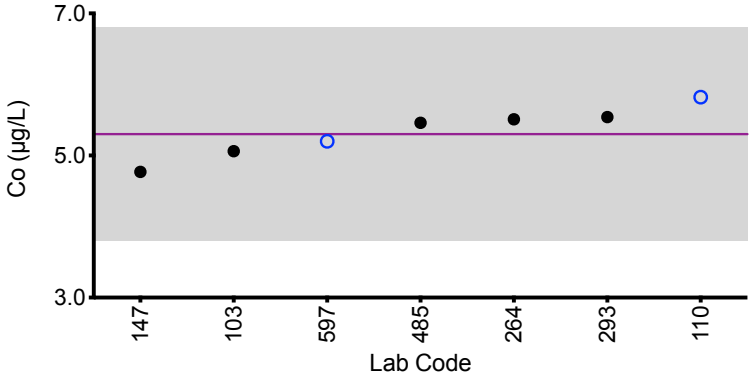
SE22-01



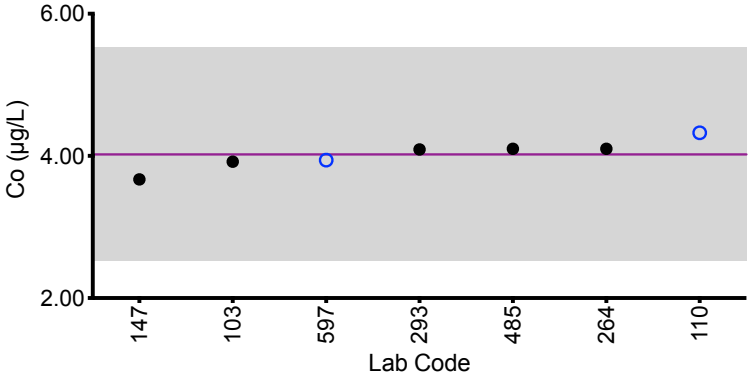
SE22-02



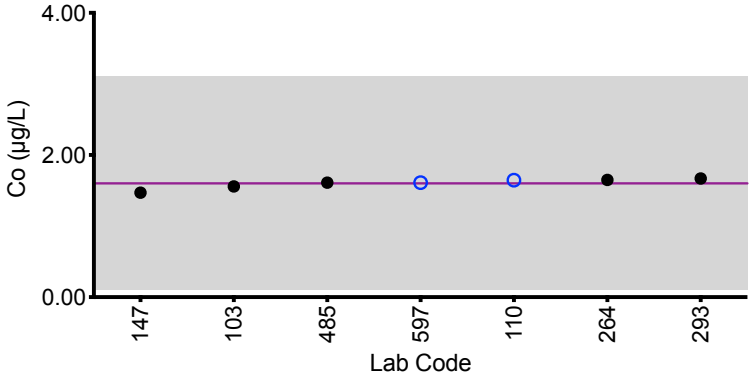
SE22-03



SE22-04



SE22-05



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 #1, 2022:
Summary Statistics

	Serum Cr (µg/L)				
	SE22-01	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
Target (Arithmetic Mean ($\bar{x}$))	11.0	8.3	3.2	6.3	0.62
Upper Limit	13.2	10.3	5.2	8.3	2.62
Lower Limit	8.8	6.3	1.2	4.3	0.00
Arithmetic SD (s)	0.8	0.5	0.4	0.5	0.10
Arithmetic RSD (%)	7.3	6.0	12	7.9	16
Number of Sample Measurements (N)	7	7	7	7	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 #1, 2022:
Performance of Participating Laboratories

		Serum Cr (µg/L)				
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
	Target	**11.0**	**8.3**	**3.2**	**6.3**	**0.62**
103	ICP-MS/MS	11.4	8.55	3.20	6.45	0.504
110	DRC/CC-ICP-MS	12.5	8.86	3.73	7.00	0.67
147	DRC/CC-ICP-MS	10.70	8.01	3.22	6.19	0.546
264	ICP-MS	10.55	8.24	3.29	5.98	0.69
293	DRC/CC-ICP-MS	11.03	8.49	3.54	6.50	0.77
485	HR-ICP-MS	10.6	8.49	3.27	6.38	0.55
597	ICP-MS/MS	10.1	7.41	2.46	5.54	<1.01

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

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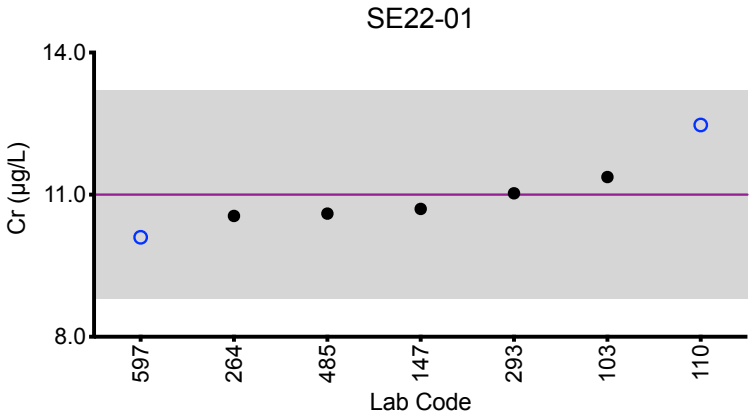
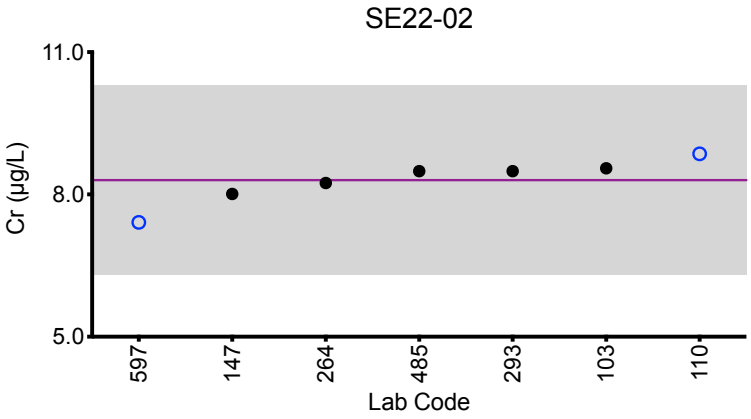
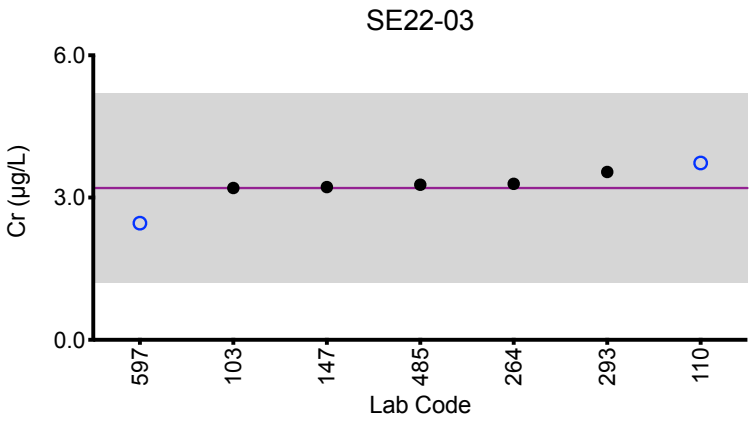
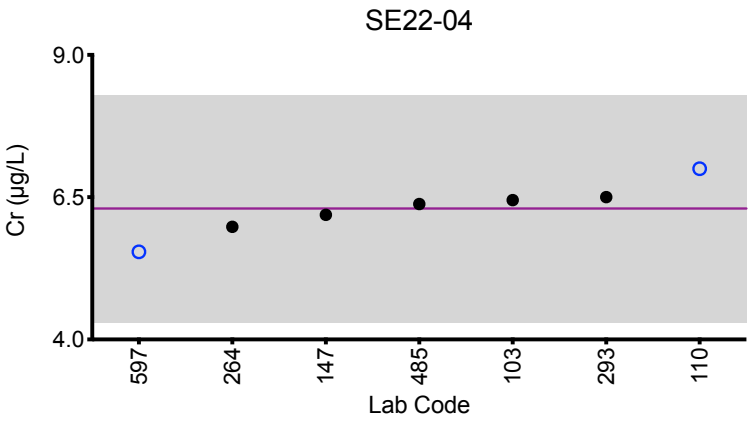
Results for Event #1, 2022: Summary Figures

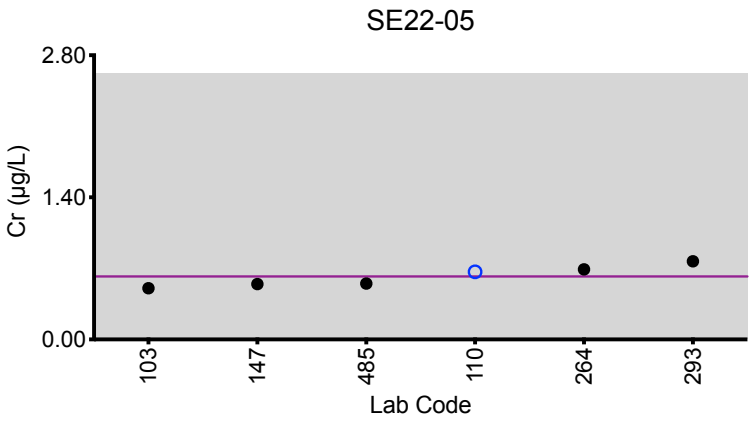
Serum Cr











Legend:

o C/HHEAR Labs ● Other Labs

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

Gray area = acceptable range based on quality specifications:

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

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Results for Event #1, 2022:
Summary Statistics

	Serum Cu (µg/L)				
	SE22-01	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
Target (Arithmetic Mean ($\bar{x}$))	860	2280	1860	1080	940
Upper Limit	990	2620	2140	1240	1080
Lower Limit	730	1940	1580	920	800
Arithmetic SD (s)	50	120	90	40	60
Arithmetic RSD (%)	5.8	5.3	4.8	3.7	6.4
Number of Sample Measurements (N)	7	7	7	7	7

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 #1, 2022:
Performance of Participating Laboratories

Serum Cu (µg/L)						
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
	Target	**860**	**2280**	**1860**	**1080**	**940**
107	DRC/CC-ICP-MS	858	2327	1932	1116	989
110	ICP-MS	893	2434	1988	1144	978
147	DRC/CC-ICP-MS	845	2300	1849	1086	959
264	ICP-MS	812.3	2286.9	1874.3	1088.8	976.8
293	DRC/CC-ICP-MS	826	2238	1805	1055	909
436	FAAS	953	2033	1715.7	1016.73	826.09
597	ICP-MS/MS	849	2340	1870	1080	948

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

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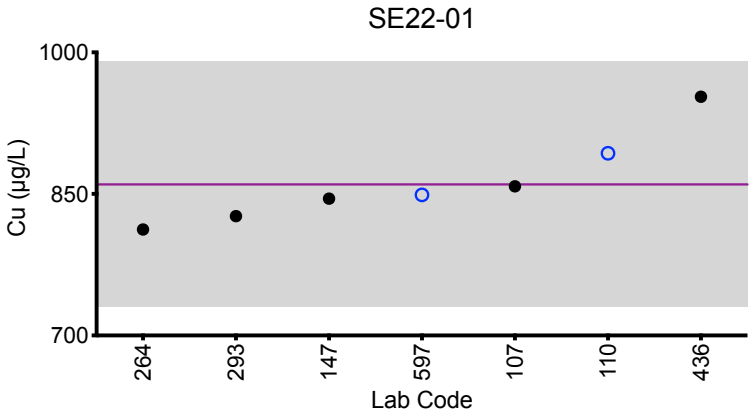
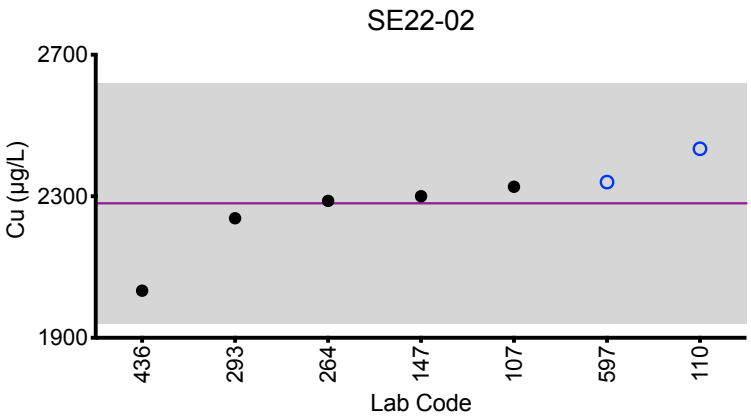
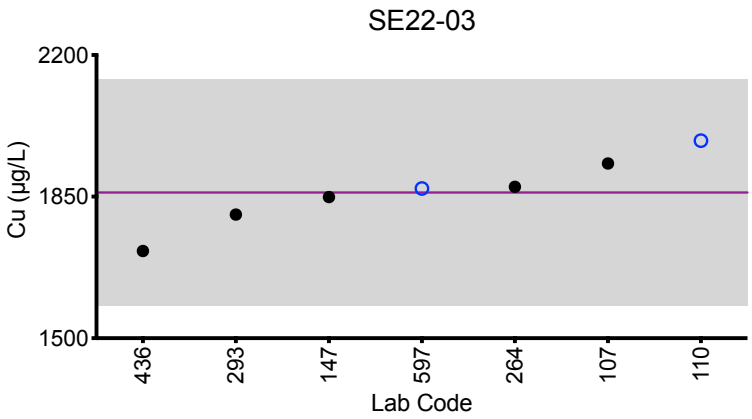
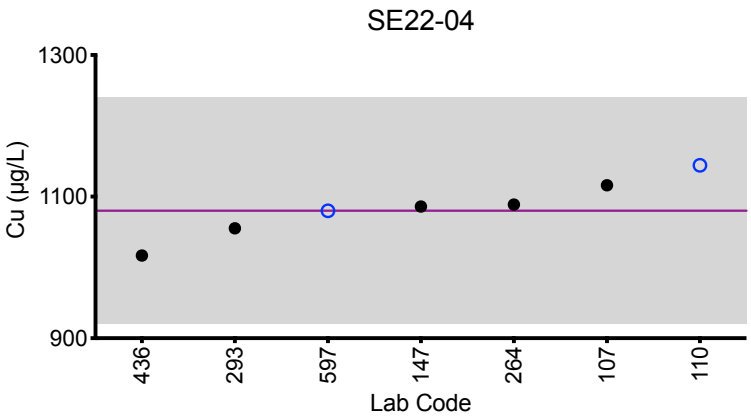
Results for Event #1, 2022: Summary Figures

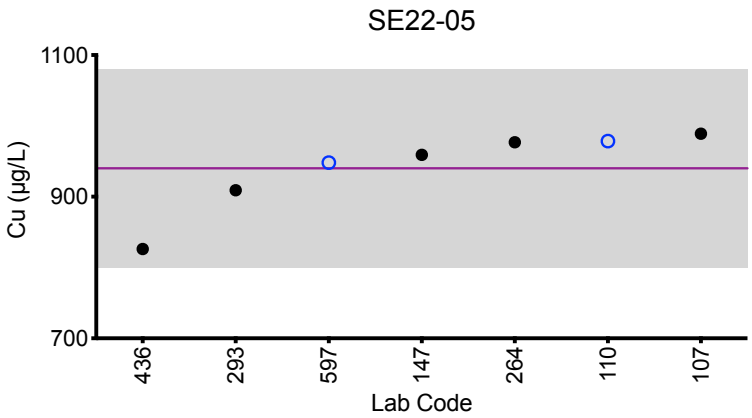
Serum Cu











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 #1, 2022: Summary Statistics

Serum Se (µg/L)					
	SE22-01	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
Target (Arithmetic Mean ($\bar{x}$))	208	123	174	136	287
Upper Limit	250	148	209	163	344
Lower Limit	166	98	139	109	230
Arithmetic SD (s)	9	5	7	5	11
Arithmetic RSD (%)	4.3	4.1	4.0	3.7	3.8
Number of Sample Measurements (N)	7	7	7	7	7

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

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Results for Event #1, 2022:
Performance of Participating Laboratories

		Serum Se (µg/L)				
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
	Target	**208**	**123**	**174**	**136**	**287**
103	ICP-MS/MS	217	127	176	139	303
107	DRC/CC-ICP-MS	207.8	124.4	178.1	137.5	280.8
110	DRC/CC-ICP-MS	211	126	180	139	276
147	DRC/CC-ICP-MS	195	113	162	126	275
264	ICP-MS	196.91	120.53	169.61	132.64	283.62
293	DRC/CC-ICP-MS	220	128	180	140	297
597	ICP-MS/MS	210	125	175	135	292

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

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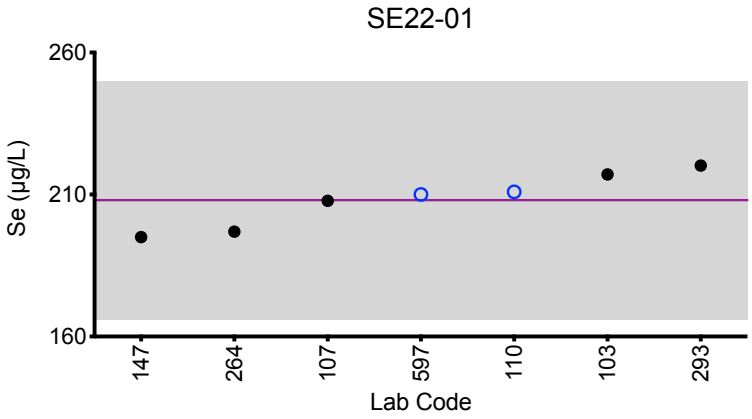
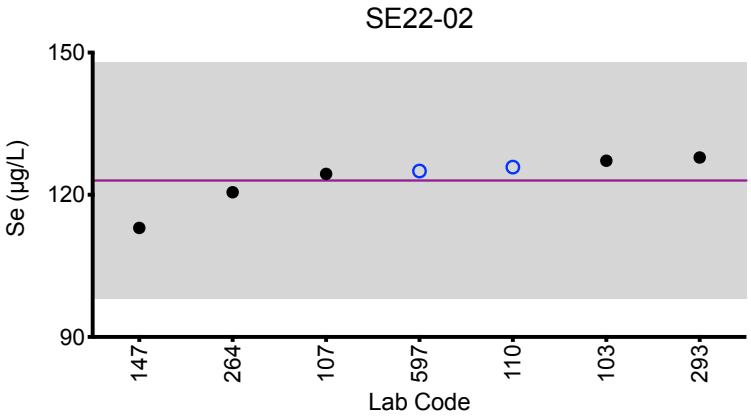
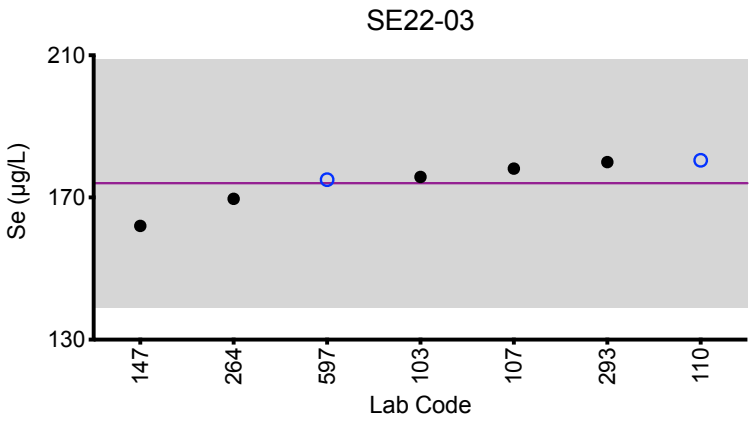
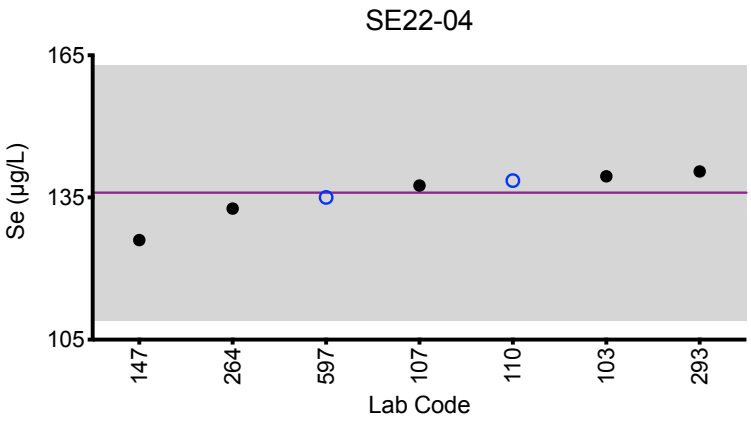
Results for Event #1, 2022: Summary Figures

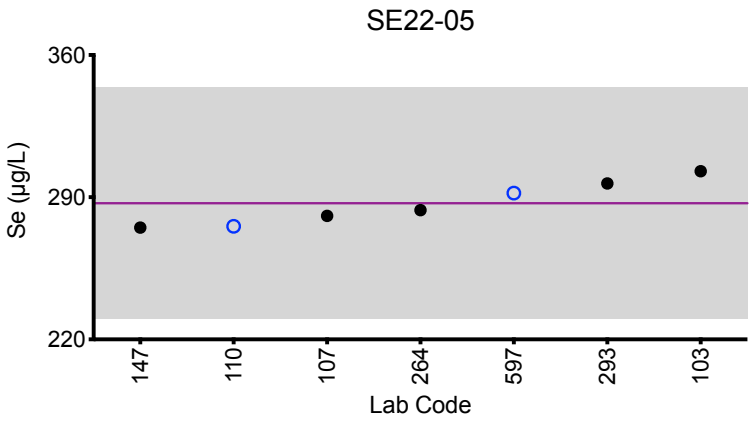
Serum Se











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 #1, 2022: Summary Statistics

Serum Zn (µg/L)					
	SE22-01	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
Target (Arithmetic Mean ($\bar{x}$))	680	668	709	798	737
Upper Limit	782	768	815	918	848
Lower Limit	578	568	603	678	626
Arithmetic SD (s)	31	34	36	35	26
Arithmetic RSD (%)	4.6	5.1	5.1	4.4	3.5
Number of Sample Measurements (N)	6	6	6	6	6

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 #1, 2022:
Performance of Participating Laboratories

		Serum Zn (µg/L)				
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
	Target	**680**	**668**	**709**	**798**	**737**
107	DRC/CC-ICP-MS	681	664	722	830	752
110	ICP-MS	729	724	772	845	773
147	DRC/CC-ICP-MS	673	660	693	791	732
264	ICP-MS	637.5	639.2	681.4	762.8	718.2
293	DRC/CC-ICP-MS	667	634	673	758	699
597	ICP-MS/MS	694	689	714	801	749

Based on the grading criteria for Zn in Serum, 100% of results were satisfactory, with 0 of the 6 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

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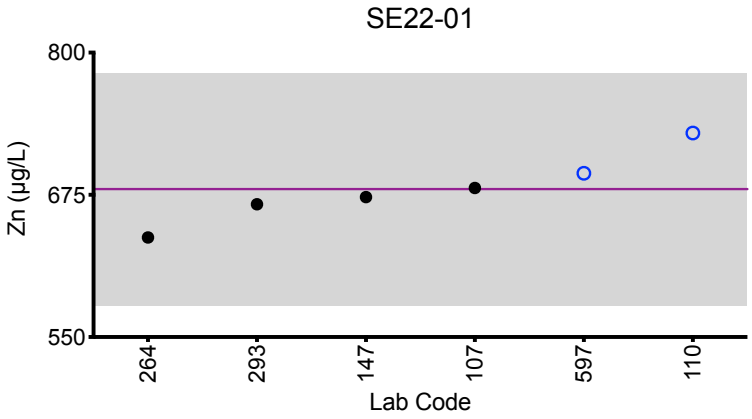
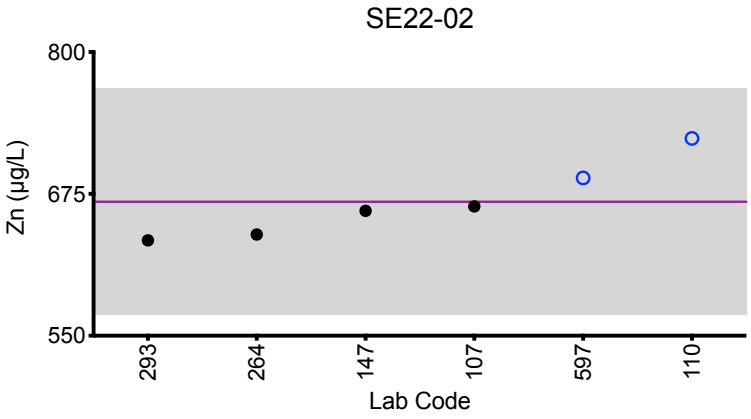
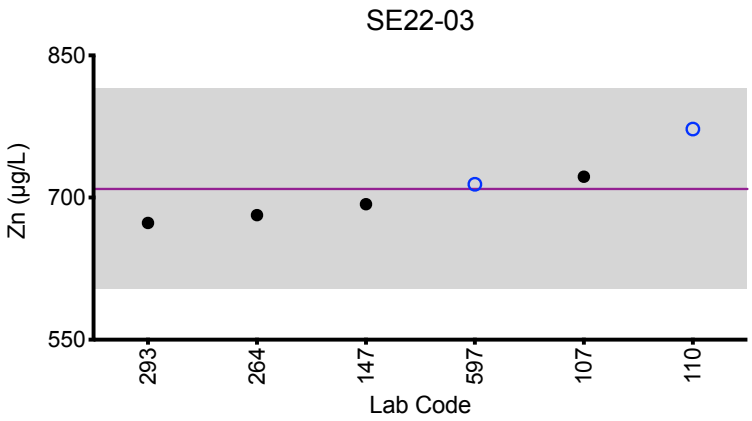
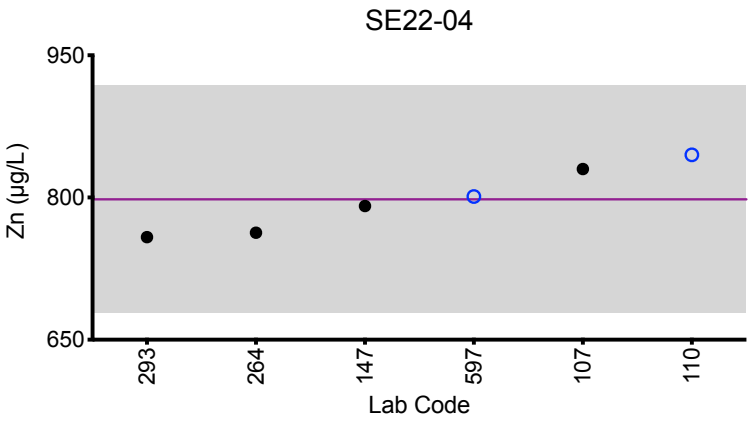
Results for Event #1, 2022: Summary Figures

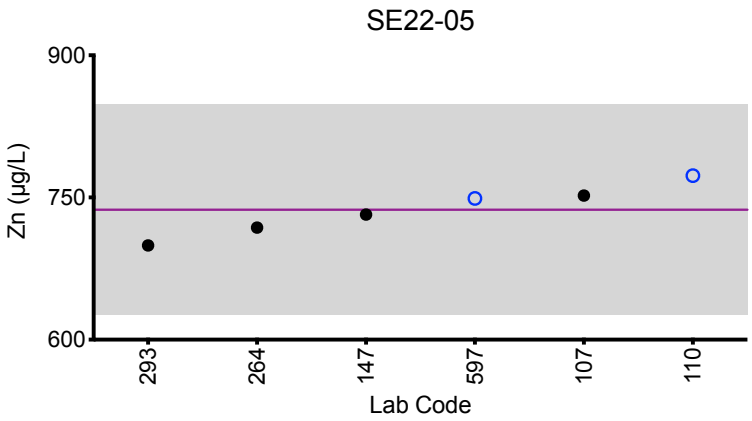
Serum Zn











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 #1, 2022:
Laboratory Data and Summary Statistics

Serum Mn (µg/L)

Lab Code	Method	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
103	ICP-MS/MS	3.02	15.4	5.94	8.27	4.11
110	ICP-MS	3.29	16.1	6.56	8.49	4.10
147	DRC/CC-ICP-MS	2.84	15.2	5.99	8.13	4.08
264	ICP-MS	3.50	16.32	6.56	8.93	*4.68
293	DRC/CC-ICP-MS	3.06	15.73	6.22	8.44	4.2
597	ICP-MS/MS	2.77	14.8	5.98	7.99	3.92

Summary Statistics

	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
Arithmetic Mean ($\bar{x}$)	3.1	15.6	6.2	8.4	4.09
Arithmetic SD (s)	0.3	0.6	0.3	0.3	0.11
Arithmetic RSD (%)	8.8	3.8	4.7	3.9	2.7
Number of Sample Measurements (N)	6	6	6	6	5

*Denotes a statistical Outlier.

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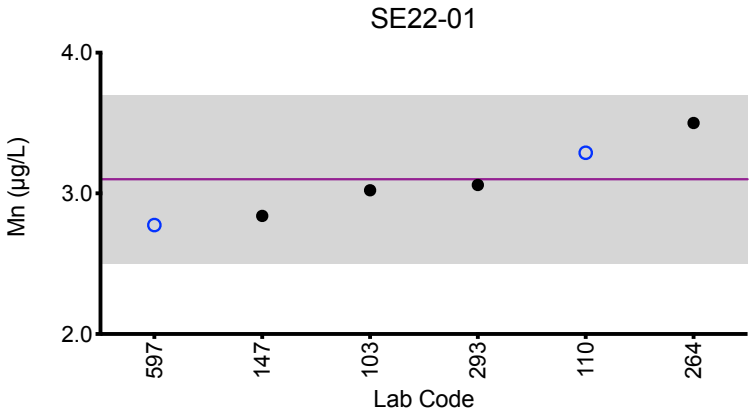
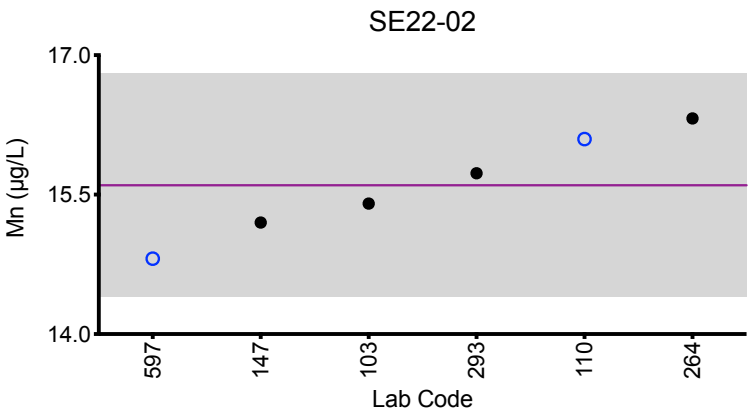
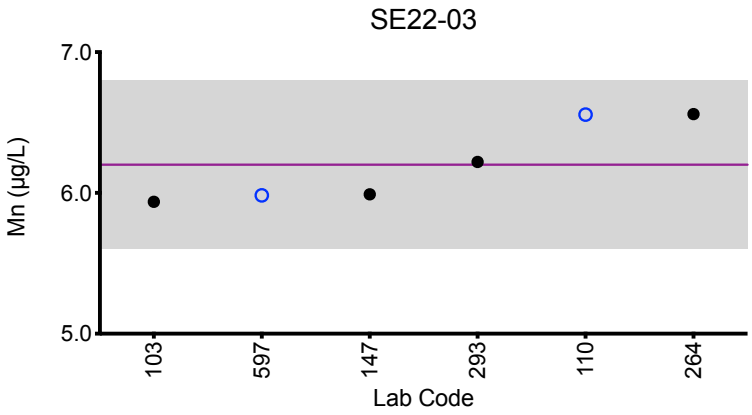
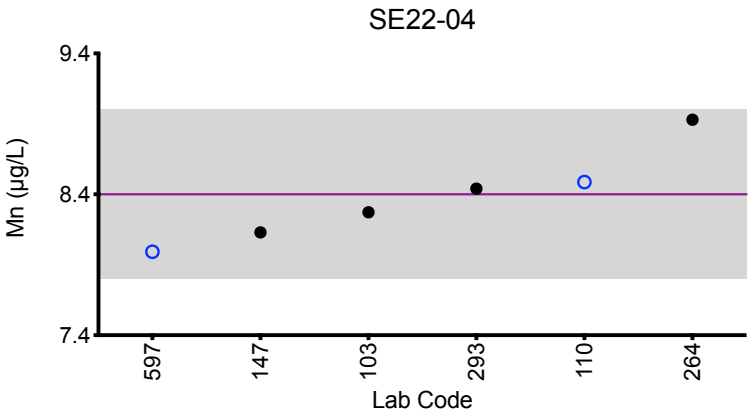
Results for Event #1, 2022: Summary Figures

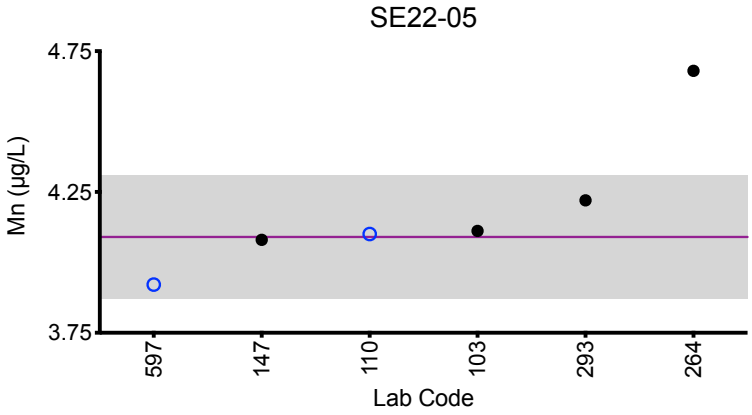
Serum Mn











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 #1, 2022:
Laboratory Data and Summary Statistics

Serum Mo (µg/L)

Lab Code	Method	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
103	ICP-MS/MS	7.19	3.94	0.740	2.78	5.04
110	ICP-MS	7.39	4.36	0.97	3.06	5.39
147	DRC/CC-ICP-MS	6.62	3.71	0.746	2.63	4.90
293	DRC/CC-ICP-MS	7.24	4.13	0.83	2.85	5.34
485	HR-ICP-MS	7.08	3.99	0.79	2.81	5.19
597	ICP-MS/MS	7.05	4.17	0.816	2.78	5.19

Summary Statistics

	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
Arithmetic Mean ($\bar{x}$)	7.1	4.05	0.81	2.82	5.17
Arithmetic SD (s)	0.3	0.22	0.08	0.14	0.18
Arithmetic RSD (%)	3.7	5.4	9.9	5.0	3.5
Number of Sample Measurements (N)	6	6	6	6	6

*Denotes a statistical Outlier.

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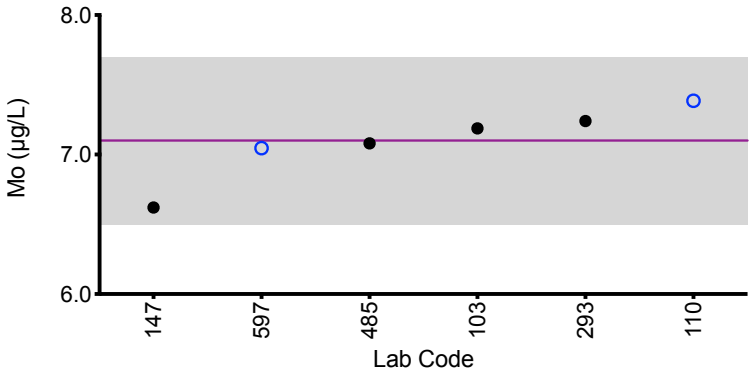
Results for Event #1, 2022: Summary Figures

Serum Mo

SE22-01



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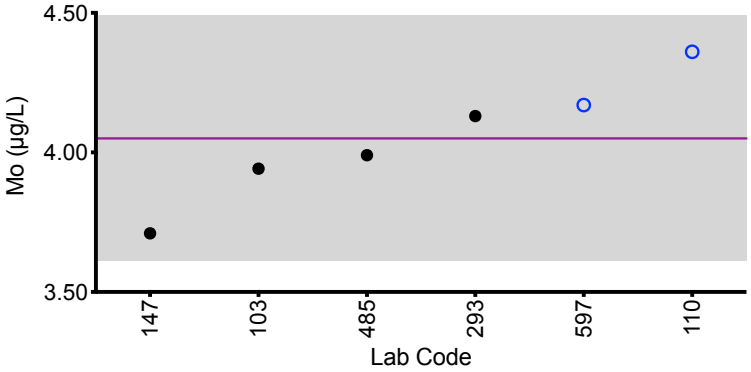

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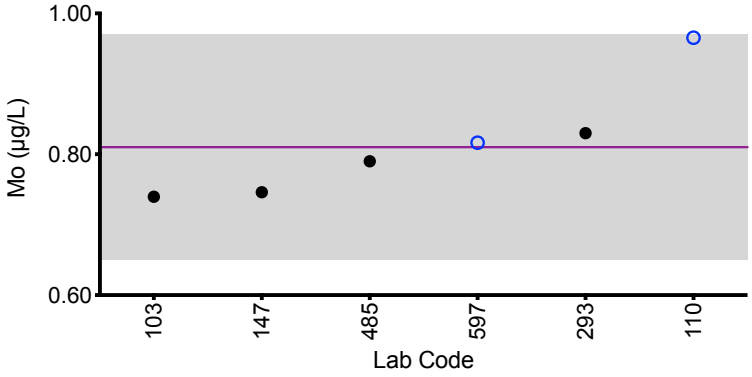

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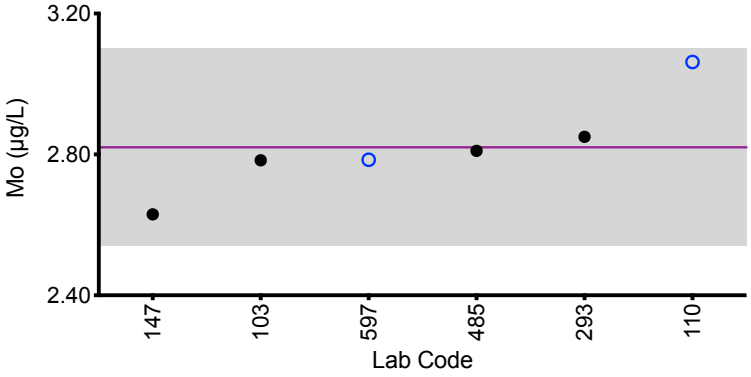
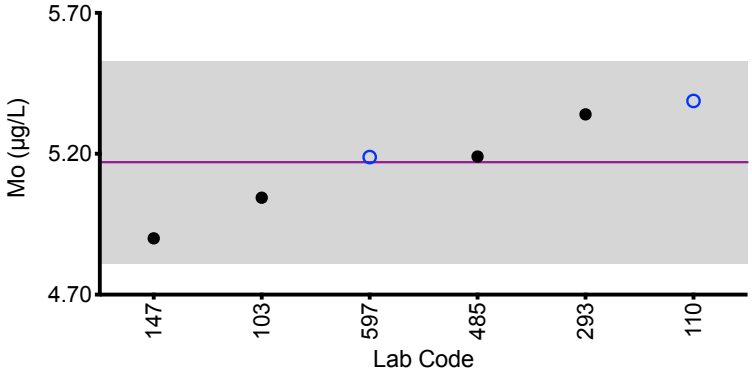


SE22-05



Legend:
o C/HHEAR Labs ● Other Labs
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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum Ni (µg/L)

Lab Code	Method	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
110	DRC/CC-ICP-MS	24.0	8.95	2.96	2.01	4.98
147	DRC/CC-ICP-MS	23.1	6.58	2.72	1.78	4.64
293	DRC/CC-ICP-MS	24.29	7.55	3.27	2.08	4.82
442	DRC/CC-ICP-MS	23.9	7.48	3.30	2.07	5.13
485	HR-ICP-MS	23.3	7.62	3.08	1.97	4.95
597	ICP-MS/MS	22.4	6.35	2.30	*0.887	*3.87

Summary Statistics

	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
Arithmetic Mean ($\bar{x}$)	23.5	7.4	2.9	1.98	4.90
Arithmetic SD (s)	0.7	0.9	0.4	0.12	0.18
Arithmetic RSD (%)	3.0	12	14	6.1	3.7
Number of Sample Measurements (N)	6	6	6	5	5

*Denotes a statistical Outlier.

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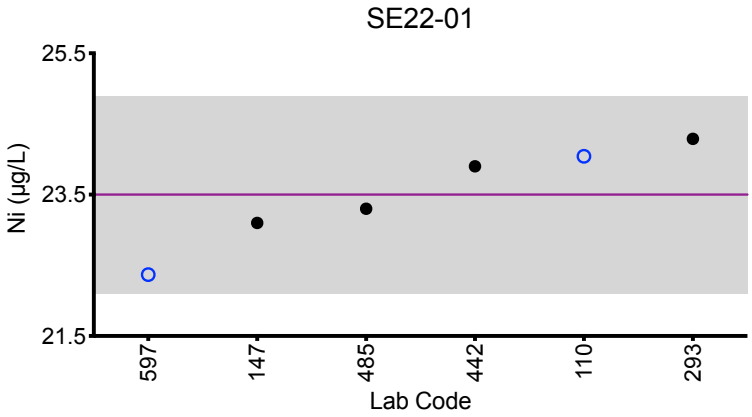
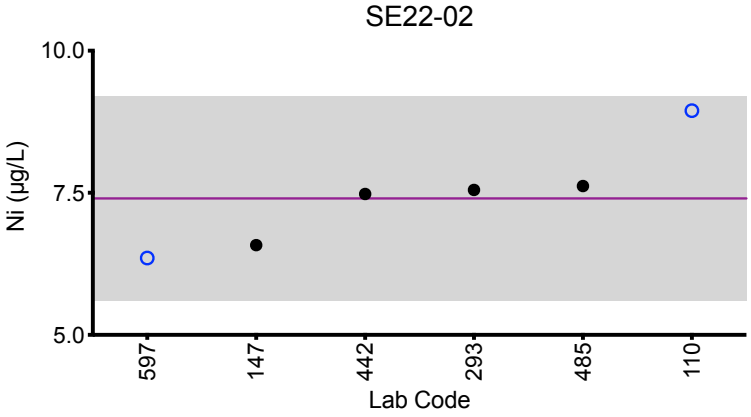
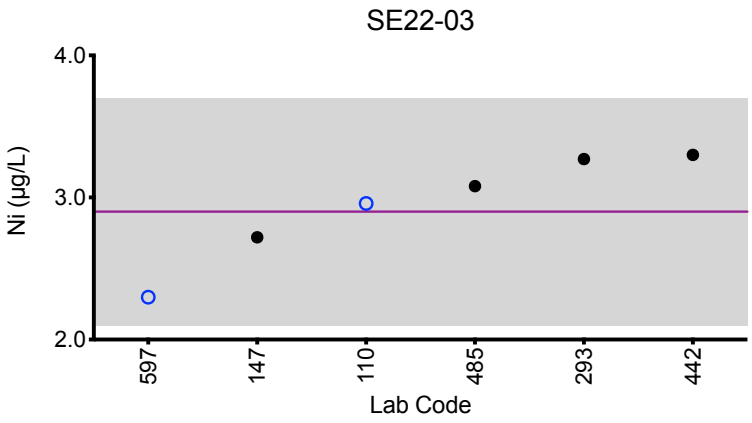
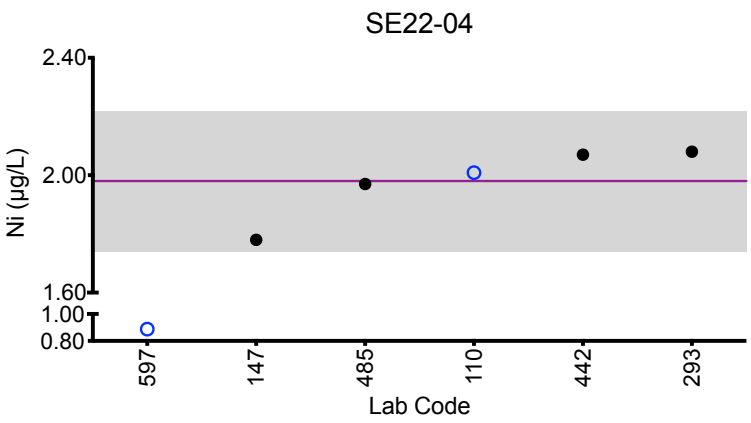
Results for Event #1, 2022: Summary Figures

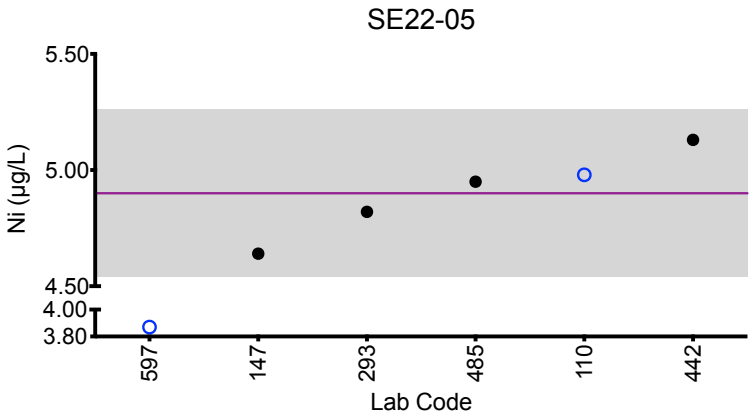
Serum Ni











Legend:
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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum V (µg/L)

Lab Code	Method	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
110	DRC/CC-ICP-MS	0.3	0.3	0.6	0.9	1.1
147	DRC/CC-ICP-MS	0.154	0.143	0.247	0.628	0.862
293	DRC/CC-ICP-MS	0.6	0.6	0.7	1.2	1.3
485	HR-ICP-MS	0.168	0.152	0.295	0.69	0.944
597	ICP-MS/MS	<0.157	<0.157	<0.157	0.264	0.53

Summary Statistics

	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
Arithmetic Mean ($\bar{x}$)	NA	NA	NA	NA	NA
Arithmetic SD (s)	NA	NA	NA	NA	NA
Arithmetic RSD (%)	NA	NA	NA	NA	NA
Number of Sample Measurements (N)	NA	NA	NA	NA	NA

*Denotes a statistical Outlier.

Statistical data was not calculated for SE22-01, SE22-02, SE22-03, SE22-04 and SE22-05 based on a lack of consensus among participating labs.

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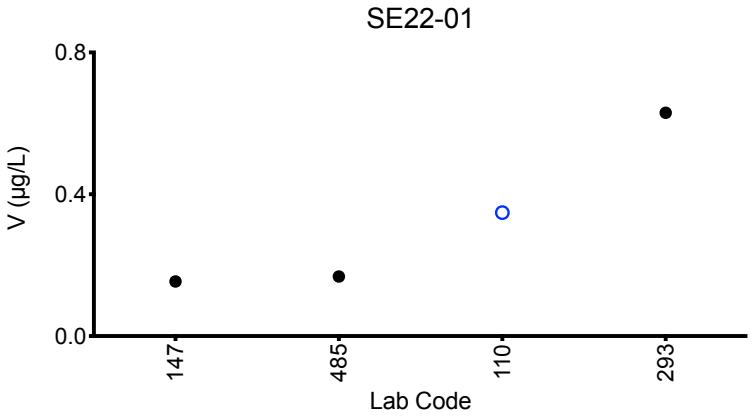
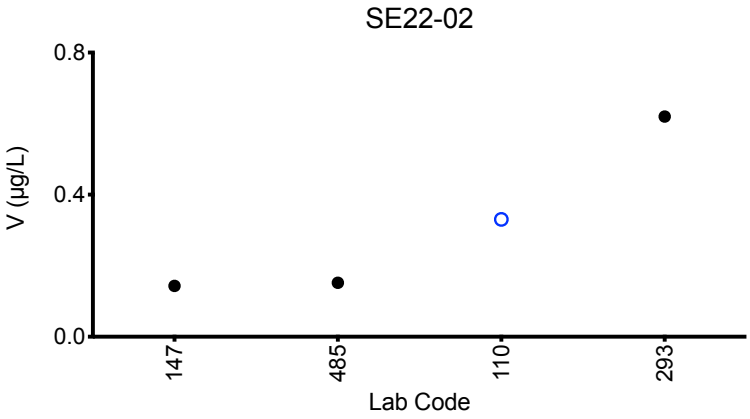
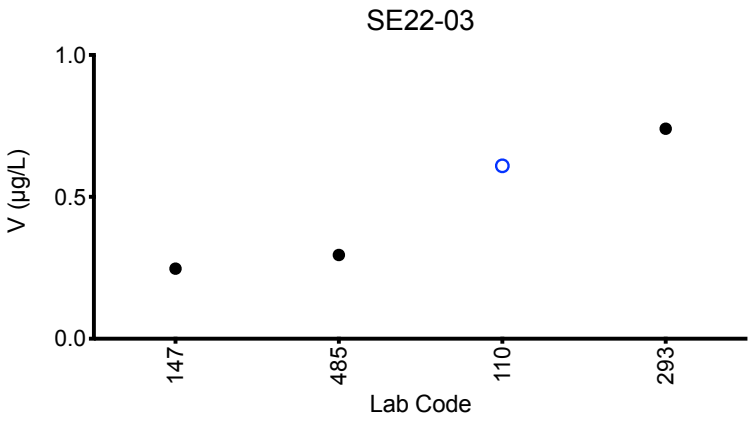
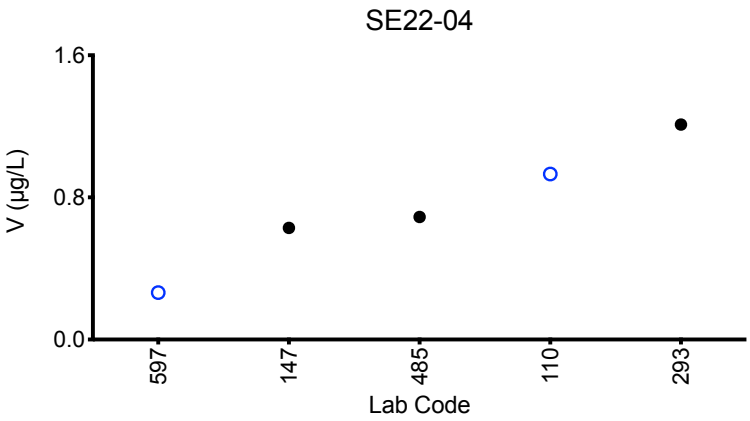
Results for Event #1, 2022: Summary Figures

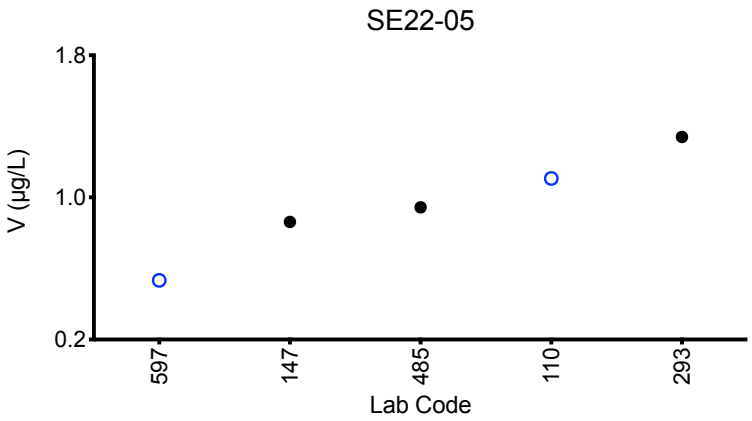
Serum V











Legend:
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Gray area = ±2SD of the mean.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum As (µg/L)

Lab Code	Method	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
103	ICP-MS/MS	7.15	1.20	21.2	2.65	13.1
110	DRC/CC-ICP-MS	7.47	1.24	22.1	2.65	12.8
147	DRC/CC-ICP-MS	6.57	1.22	19.9	2.54	12.7
597	ICP-MS/MS	7.11	1.57	21.1	2.99	12.8

Summary Statistics

	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
Arithmetic Mean ($\bar{x}$)	7.1	1.31	21.1	2.7	12.84
Arithmetic SD (s)	0.4	0.17	0.9	0.2	0.15
Arithmetic RSD (%)	5.6	13	4.3	7.0	1.2
Number of Sample Measurements (N)	4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum Ba (µg/L)

Lab Code	Method	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
110	ICP-MS	1.68	0.73	1.03	0.74	1.36
147	ICP-MS	1.35	0.658	0.981	0.750	0.898
597	ICP-MS/MS	1.46	0.749	1.16	0.724	0.915

Summary Statistics

	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
Arithmetic Mean ($\bar{x}$)	1.5	0.71	1.06	0.738	1.1
Arithmetic SD (s)	0.2	0.05	0.09	0.013	0.3
Arithmetic RSD (%)	11	7.0	8.5	1.8	27
Number of Sample Measurements (N)	3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum Be (µg/L)

Lab Code	Method	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
110	ICP-MS	0.595	6.94	3.61	2.81	4.38
147	ICP-MS	0.495	5.77	2.89	2.47	3.94
293	ICP-MS	0.580	6.55	3.26	2.60	3.930
597	ICP-MS/MS	0.550	6.65	3.44	2.61	4.09

Summary Statistics

	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
Arithmetic Mean ($\bar{x}$)	0.55	6.5	3.3	2.62	4.1
Arithmetic SD (s)	0.04	0.5	0.3	0.14	0.2
Arithmetic RSD (%)	7.3	7.7	9.1	5.3	5.1
Number of Sample Measurements (N)	4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum Cd (µg/L)						
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
103	ICP-MS/MS	1.02	2.69	6.25	3.39	0.304
110	ICP-MS	0.989	2.89	6.91	3.50	0.353
147	ICP-MS	0.940	2.53	6.09	3.28	0.294
597	ICP-MS/MS	0.970	2.77	6.63	3.39	0.298
Summary Statistics						
		SE22-01	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
Arithmetic Mean ($\bar{x}$)		0.98	2.72	6.5	3.39	0.31
Arithmetic SD (s)		0.03	0.15	0.4	0.09	0.03
Arithmetic RSD (%)		3.1	5.5	6.2	2.7	9.0
Number of Sample Measurements (N)		4	4	4	4	4

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum Cs (µg/L)

Lab Code	Method	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
110	ICP-MS	0.740	0.886	0.649	0.738	0.856
597	ICP-MS/MS	0.649	0.812	0.653	0.640	0.800

Summary Statistics

	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
Arithmetic Mean ($\bar{x}$)	0.69	0.85	0.651	0.69	0.83
Arithmetic SD (s)	0.06	0.05	0.003	0.07	0.04
Arithmetic RSD (%)	8.7	5.9	0.46	10	4.8
Number of Sample Measurements (N)	2	2	2	2	2

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum Hg (µg/L)

Lab Code	Method	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
103	ICP-MS/MS	6.61	3.74	0.793	2.15	5.04
110	ICP-MS	6.85	3.71	0.93	2.28	4.93
597	ICP-MS/MS	6.68	3.83	1.02	2.31	5.09

Summary Statistics

	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
Arithmetic Mean ($\bar{x}$)	6.71	3.76	0.91	2.25	5.02
Arithmetic SD (s)	0.12	0.07	0.11	0.08	0.08
Arithmetic RSD (%)	1.8	1.9	12	3.6	1.6
Number of Sample Measurements (N)	3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum I (µg/L)						
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
147	ICP-MS	34.9	48.7	34.6	72.5	51.0
442	ICP-MS	40.7	55.9	40.6	83.3	57.0

Summary Statistics					
	SE22-01	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
Arithmetic Mean ($\bar{x}$)	38	52	38	78	54
Arithmetic SD (s)	4	5	4	8	4
Arithmetic RSD (%)	11	9.6	11	10	7.4
Number of Sample Measurements (N)	2	2	2	2	2

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum Mg (µg/L)						
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
264	ICP-MS	21636	24311	22003	19564	25154
597	ICP-MS/MS	20100	22900	20500	18200	22800
Summary Statistics						
		SE22-01	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
Arithmetic Mean ($\bar{x}$)		20900	23600	21300	18900	24000
Arithmetic SD (s)		1100	1000	1100	1000	1700
Arithmetic RSD (%)		5.3	4.2	5.2	5.3	7.1
Number of Sample Measurements (N)		2	2	2	2	2

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum Pb (µg/L)						
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
103	ICP-MS/MS	4.08	1.45	7.92	4.45	3.20
110	ICP-MS	4.20	1.49	8.49	4.71	3.34
597	ICP-MS/MS	4.08	1.58	7.98	4.42	3.26
Summary Statistics						
		SE22-01	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
Arithmetic Mean ($\bar{x}$)		4.12	1.50	8.1	4.53	3.27
Arithmetic SD (s)		0.07	0.07	0.3	0.16	0.07
Arithmetic RSD (%)		1.7	4.7	3.7	3.5	2.1
Number of Sample Measurements (N)		3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum Pt (µg/L)

Lab Code	Method	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
110	ICP-MS	0.41	1.62	1.85	1.23	0.58
264	ICP-MS	*0.10	*1.09	*1.24	*0.75	*0.24
293	DRC/CC-ICP-MS	0.35	1.46	1.64	1.08	0.51

Summary Statistics

	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
Arithmetic Mean ($\bar{x}$)	0.38	1.5	1.7	1.2	0.54
Arithmetic SD (s)	0.04	0.1	0.1	0.1	0.05
Arithmetic RSD (%)	11	7.4	8.6	9.4	8.7
Number of Sample Measurements (N)	2	2	2	2	2

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum Sb (µg/L)

Lab Code	Method	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
103	ICP-MS/MS	6.01	4.11	2.06	1.06	0.705
110	ICP-MS	6.81	4.38	2.48	1.16	0.739
147	ICP-MS	6.21	3.93	2.26	1.06	0.712
597	ICP-MS/MS	6.47	4.21	2.42	1.20	0.82

Summary Statistics

	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
Arithmetic Mean ($\bar{x}$)	6.4	4.16	2.30	1.12	0.75
Arithmetic SD (s)	0.3	0.19	0.19	0.07	0.06
Arithmetic RSD (%)	4.7	4.6	8.3	6.3	8.0
Number of Sample Measurements (N)	4	4	4	4	4

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum Sn (µg/L)

Lab Code	Method	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
110	ICP-MS	2.74	5.20	11.3	9.70	0.99
597	ICP-MS/MS	2.38	4.71	10.0	8.90	1.08

Summary Statistics

	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
Arithmetic Mean ($\bar{x}$)	2.6	5.0	10.6	9.3	1.04
Arithmetic SD (s)	0.3	0.3	0.9	0.6	0.06
Arithmetic RSD (%)	12	6.0	8.5	6.5	5.8
Number of Sample Measurements (N)	2	2	2	2	2

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum Sr (µg/L)						
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
103	ICP-MS/MS	101	63.7	57.6	98.6	60.9
200	ICP-MS	115.6	69.2	68.3	119.1	73.6
597	ICP-MS/MS	99.6	64.5	58.4	97.9	61.3
Summary Statistics						
		SE22-01	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
Arithmetic Mean ($\bar{x}$)		105	66	61	105	65
Arithmetic SD (s)		9	3	6	12	7
Arithmetic RSD (%)		8.6	4.5	9.8	11	11
Number of Sample Measurements (N)		3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum Ti (µg/L)						
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
200	DRC/CC-ICP-MS	4.80	4.60	3.60	4.50	*4.30
442	DRC/CC-ICP-MS	6.72	3.04	3.78	5.23	10.6
485	HR-ICP-MS	7.03	2.6	3.62	5.09	11.1
597	ICP-MS/MS	8.26	4.57	6.13	6.90	12.0
Summary Statistics						
		SE22-01	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
Arithmetic Mean ($\bar{x}$)		6.7	3.7	4.3	5.4	11.2
Arithmetic SD (s)		1.4	1.0	1.2	1.0	0.7
Arithmetic RSD (%)		21	27	28	19	6.5
Number of Sample Measurements (N)		4	4	4	4	3

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum Tl (µg/L)

Lab Code	Method	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
103	ICP-MS/MS	4.47	0.899	2.71	1.18	0.214
110	ICP-MS	4.53	0.901	2.85	1.24	0.218
147	ICP-MS	4.29	0.838	2.60	1.14	0.203
597	ICP-MS/MS	4.53	0.937	2.79	1.22	0.203

Summary Statistics

	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
Arithmetic Mean ($\bar{x}$)	4.45	0.89	2.74	1.20	0.210
Arithmetic SD (s)	0.11	0.04	0.11	0.05	0.008
Arithmetic RSD (%)	2.5	4.5	4.0	4.2	3.8
Number of Sample Measurements (N)	4	4	4	4	4

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum U (µg/L)

Lab Code	Method	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
103	ICP-MS/MS	0.0466	0.224	0.0961	0.135	0.209
110	ICP-MS	0.049	0.230	0.097	0.142	0.220
597	ICP-MS/MS	0.0456	0.212	0.0933	0.131	0.192

Summary Statistics

	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
Arithmetic Mean ($\bar{x}$)	0.0469	0.222	0.095	0.136	0.207
Arithmetic SD (s)	0.0015	0.009	0.002	0.005	0.014
Arithmetic RSD (%)	3.2	4.1	1.8	3.7	6.8
Number of Sample Measurements (N)	3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #1, 2022:
Laboratory Data and Summary Statistics

Serum W (µg/L)

Lab Code	Method	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
110	ICP-MS	4.68	0.94	3.52	2.26	0.42
200	ICP-MS	4.34	0.92	3.49	2.11	0.40
597	ICP-MS/MS	4.45	0.87	3.28	2.08	0.395

Summary Statistics

	SE22-01	SE22-02	SE22-03	SE22-04	SE22-05
Arithmetic Mean ($\bar{x}$)	4.5	0.91	3.43	2.15	0.404
Arithmetic SD (s)	0.2	0.04	0.13	0.10	0.011
Arithmetic RSD (%)	3.8	4.4	3.8	4.7	2.7
Number of Sample Measurements (N)	3	3	3	3	3

*Denotes a statistical Outlier.

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Results for Event #1, 2022: Additional Elements in Serum

Serum B (µg/L)						
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
200	ICP-MS	43.00	45.00	52.00	43.00	91.00

Serum Bi (µg/L)						
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
147	ICP-MS	<0.0397	<0.0397	<0.0397	<0.0397	<0.0397
597	ICP-MS/MS	<0.0357	<0.0357	<0.0357	<0.0357	<0.0357

Serum Fe (µg/L)						
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
264	ICP-MS	1230.7	1175.3	1224.7	655.6	1223.7

Serum Li (µg/L)						
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
147	ICP-MS	1.12	0.916	1.03	0.346	0.972

Serum Th (µg/L)						
Lab Code	**Method**	**SE22-01**	**SE22-02**	**SE22-03**	**SE22-04**	**SE22-05**
597	ICP-MS/MS	<0.0142	<0.0142	<0.0142	<0.0142	<0.0142

References

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

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