NEW YORK STATE | Department of Health | Wadsworth Center

New York State Biomonitoring Program for Trace Elements

Event #3, 2018

Trace Elements in Whole Blood, Urine, and Serum

December, 2018

Wadsworth Center
NEW YORK STATE DEPARTMENT OF HEALTH
Trace Elements Laboratory

NEW YORK STATE | Department of Health | Wadsworth Center

Event #3, 2018:
Trace Elements in Whole Blood, Urine, and Serum

12/17/2018

Dear Laboratory Director,

This report summarizes performance for the third biomonitoring proficiency test (PT) event of 2018 for Trace Elements in Whole Blood, Urine, and Serum. One of the key goals of this PT program is to achieve harmonization of biomonitoring data for trace elements.

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

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

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

Samples for the next PT event (Event #1, 2019) will be shipped February 27, 2019. Comments about this report may be directed to trel@health.ny.gov. If you have not yet enrolled for next year, please contact PT program staff at trel@health.ny.gov.

Sincerely,

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

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

NEW YORK STATE | Department of Health | Wadsworth Center

Event #3, 2018

Trace Elements in Whole Blood

Wadsworth Center
NEW YORK STATE DEPARTMENT OF HEALTH
Trace Elements Laboratory

Event #3, 2018:
Trace Elements in Whole Blood

PT Materials

Human whole blood was purchased from Zen-Bio, Inc. and preserved with K2EDTA. The company certifies that this material was "non-reactive" for HBsAg, HBV DNA, HIV-1,2 Ab, HIV-1 RNA, HCV Ab, HCV RNA, and STS. Units of whole blood were filtered into polypropylene containers through cheesecloth to remove particulates and supplemented with arsenic (As), cadmium (Cd), cobalt (Co), chromium (Cr), mercury (Hg), manganese (Mn), lead (Pb), barium (Ba), beryllium (Be), copper (Cu), molybdenum (Mo), nickel (Ni), platinum (Pt), antimony (Sb), selenium (Se), tin (Sn), titanium (Ti), thallium (Tl), uranium (U), vanadium (V), tungsten (W), and zinc (Zn). Whole blood samples were placed on a rocker overnight prior to aliquoting 2-mL into polypropylene vials. PT samples were stored at -80°C until the week of the PT event, when they were thawed at 4°C prior to circulation to laboratories for analysis.

Graded Elements

Seven elements in whole blood are formally graded: As, Cd, Co, Cr, Hg, Mn, and Pb. Target values for the graded elements are assigned to these pools based on (a) the robust mean calculated from data reported by all laboratories, or (b) 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

Whole Blood As (µg/L)					
	BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Target (Arithmetic Mean ($\bar{x}$))	50.8	8.7	15.7	34.3	22.9
Upper Limit	61.0	14.7	21.7	41.2	28.9
Lower Limit	40.6	2.7	9.7	27.4	16.9
Arithmetic SD (s)	4.3	1.1	1.8	3.0	2.1
Arithmetic RSD (%)	8.5	13	11	8.7	9.2
Number of Sample Measurements (N)	9	9	9	9	9

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

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Performance of Participating Laboratories

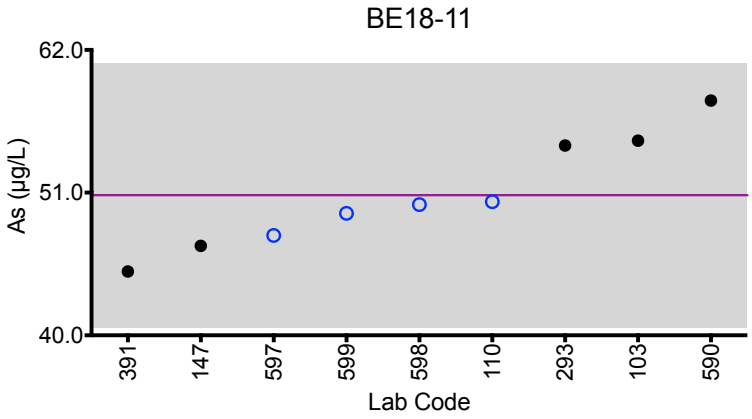
Whole Blood As (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
	Target	**50.8**	**8.7**	**15.7**	**34.3**	**22.9**
103	DRC/CC-ICP-MS	55.0	9.37	16.6	36.2	23.9
110	DRC/CC-ICP-MS	50.3	8.7	16.0	34.5	22.4
147	ICP-MS	46.9	8.01	14.0	33.4	21.0
293	DRC/CC-ICP-MS	54.63	8.96	15.75	34.91	24.47
391	ICP-MS	44.925	6.668	12.13	27.873	18.647
590	DRC/CC-ICP-MS	58.1	10.6	18.4	38.7	25.2
597	DRC/CC-ICP-MS	47.7	8.7	16.0	33.1	22.4
598	DRC/CC-ICP-MS	50.08	7.80	15.44	33.48	24.24
599	DRC/CC-ICP-MS	49.4	9.44	16.7	36.7	24.1

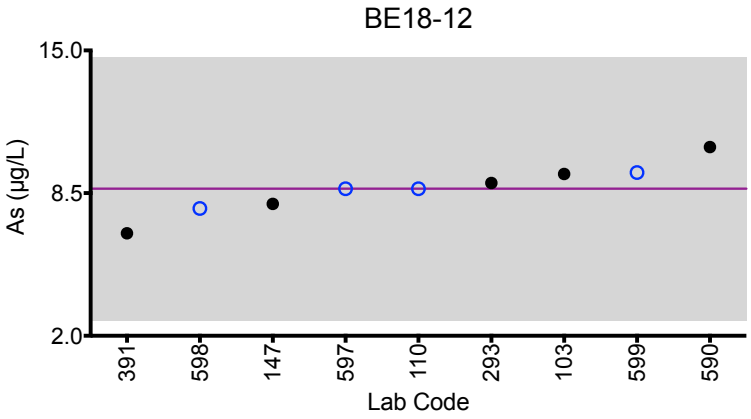
Based on the grading criteria for As in Whole Blood, 100% of results were satisfactory, with 0 of the 9 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

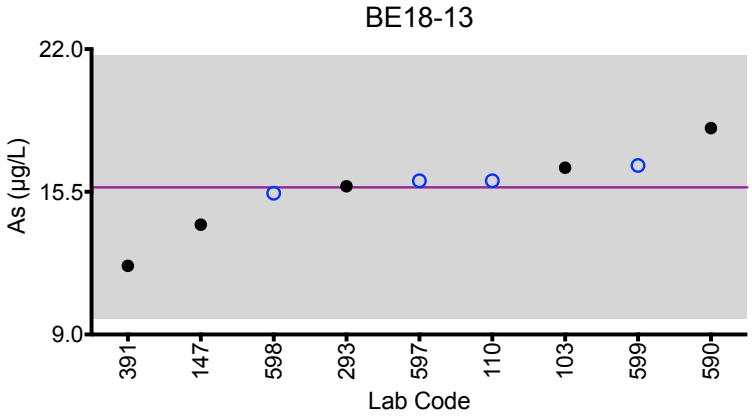
NEW YORK STATE | Department of Health | Wadsworth Center

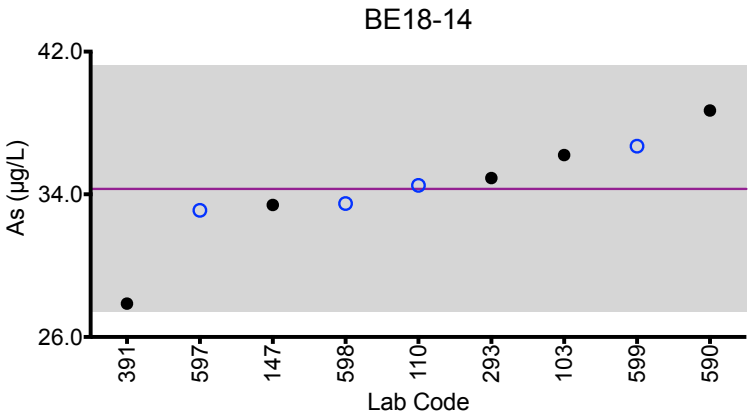
Results for Event #3, 2018: Summary Figures

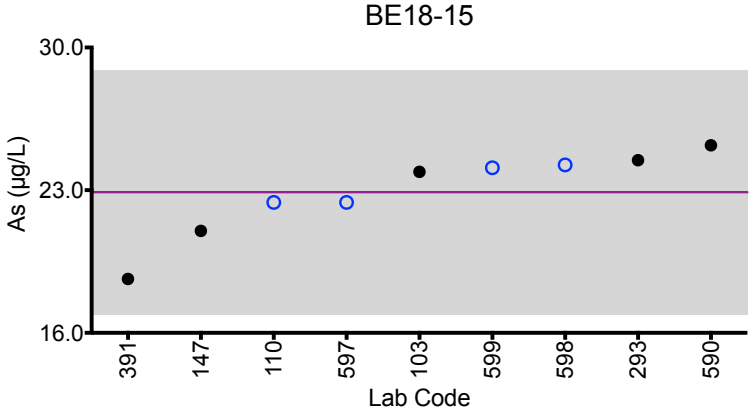
Whole Blood As











Legend:

o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

Whole Blood Cd (µg/L)					
	BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Target (Robust Mean (x*))	8.03	2.29	0.729	4.04	11.2
Upper Limit	9.23	3.29	1.729	5.04	12.9
Lower Limit	6.83	1.29	0.000	3.04	9.5
Robust SD (s*)	0.30	0.21	0.042	0.28	0.6
Robust RSD (%)	3.7	9.2	5.8	6.9	5.4
Number of Sample Measurements (N)	16	16	15	16	16
Standard Uncertainty (*u*)	0.09	0.07	0.010	0.09	0.2

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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Performance of Participating Laboratories

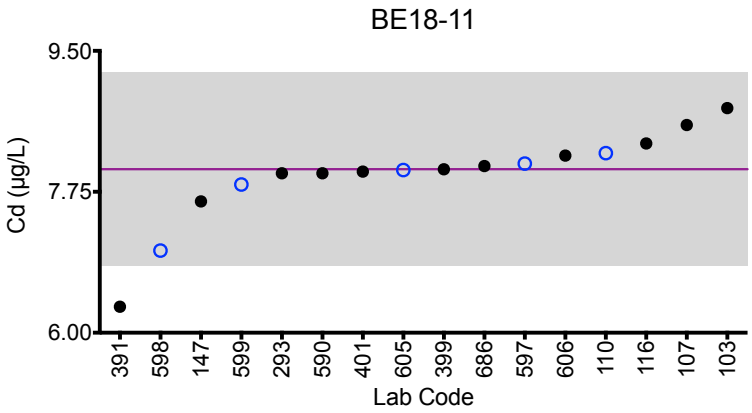
Whole Blood Cd (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
	Target	**8.03**	**2.29**	**0.729**	**4.04**	**11.2**
103	DRC/CC-ICP-MS	8.79	2.44	0.793	4.42	12.2
107	ICP-MS	8.58	2.51	0.76	4.26	11.53
110	ICP-MS	8.23	2.43	0.69	4.09	11.2
116	ICP-MS/MS	8.35	2.59	<1.50	4.67	12.5
147	ICP-MS	7.63	2.14	0.758	4.16	10.8
293	DRC/CC-ICP-MS	7.98	2.29	0.71	4.06	10.88
391	ICP-MS	6.323 ↓	1.78	0.563	3.073	8.625 ↓
399	DRC/CC-ICP-MS	8.03	2.37	0.707	4.05	11.2
401	DRC/CC-ICP-MS	8.0	2.0	0.7	3.8	10.5
590	DRC/CC-ICP-MS	7.98	2.43	0.774	4.07	11.5
597	DRC/CC-ICP-MS	8.10	2.07	0.73	3.75	11.2
598	DRC/CC-ICP-MS	7.02	2.01	0.69	3.27	9.21 ↓
599	DRC/CC-ICP-MS	7.84	2.10	0.71	3.80	10.6
605	ICP-MS	8.02	2.32	0.838	4.23	11.2
606	DRC/CC-ICP-MS	8.20	2.42	0.838	4.16	11.5
686	ICP-MS	8.07	2.41	0.716	4.05	11.6

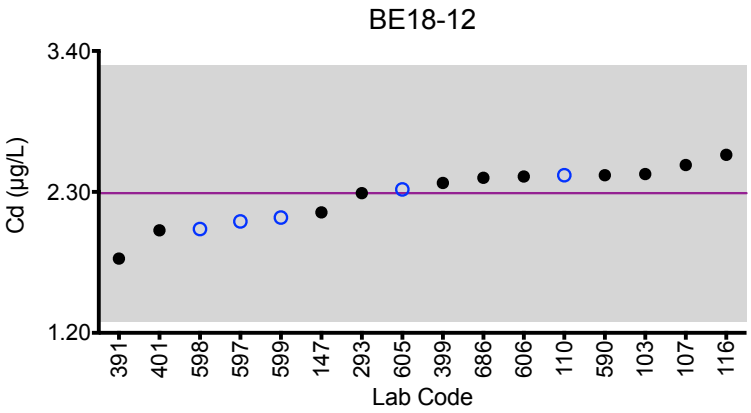
Based on the grading criteria for Cd in Whole Blood, 96% of results were satisfactory, with 1 of the 16 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

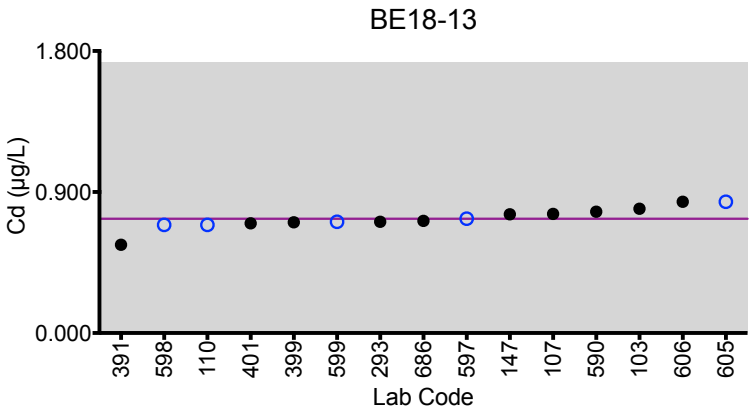
NEW YORK STATE | Department of Health | Wadsworth Center

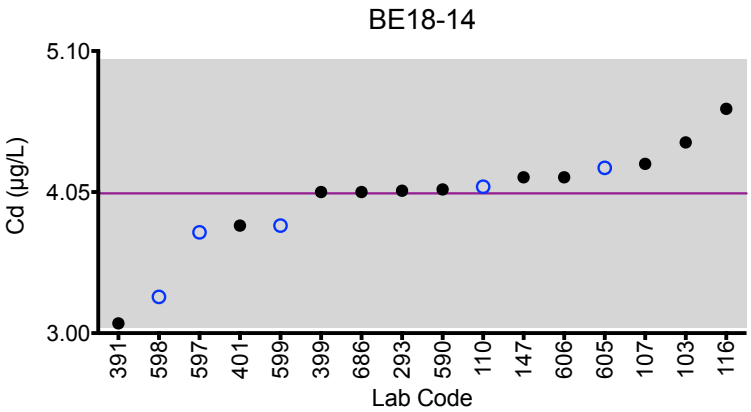
Results for Event #3, 2018: Summary Figures

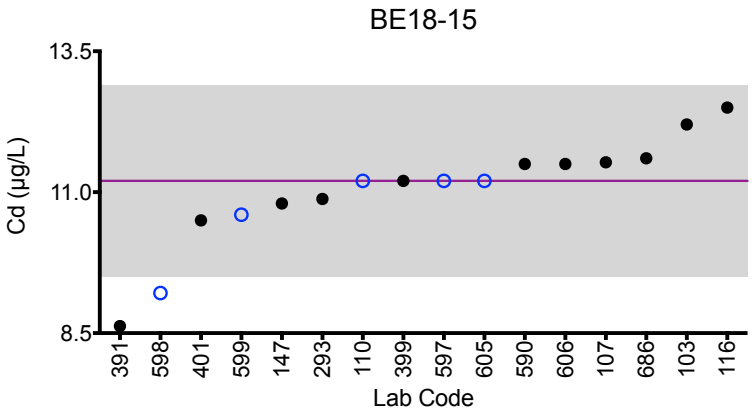
Whole Blood Cd











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

Whole Blood Co (µg/L)					
	BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Target (Robust Mean (x*))	2.79	9.1	7.0	9.5	12.2
Upper Limit	4.29	10.9	8.5	11.4	14.6
Lower Limit	1.29	7.3	5.5	7.6	9.8
Robust SD (s*)	0.06	0.7	0.4	0.5	0.5
Robust RSD (%)	2.2	7.7	5.7	5.3	4.1
Number of Sample Measurements (N)	10	10	10	10	10
Standard Uncertainty (*u*)	0.02	0.3	0.2	0.2	0.2

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

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Performance of Participating Laboratories

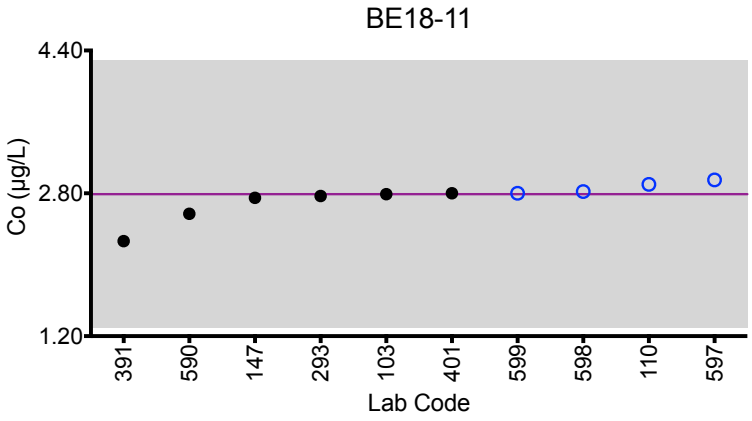
Whole Blood Co (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
	Target	**2.79**	**9.1**	**7.0**	**9.5**	**12.2**
103	DRC/CC-ICP-MS	2.79	9.32	6.95	9.58	12.3
110	ICP-MS	2.9	9.6	7.2	9.9	12.7
147	ICP-MS	2.75	8.72	6.78	9.84	11.9
293	DRC/CC-ICP-MS	2.77	8.87	6.7	9.46	12.93
391	ICP-MS	2.265	6.744 ↓	5.228 ↓	7.19 ↓	9.363 ↓
401	DRC/CC-ICP-MS	2.8	7.6	6.3	8.5	11.6
590	DRC/CC-ICP-MS	2.57	9.64	7.23	9.51	12.2
597	DRC/CC-ICP-MS	2.95	9.29	7.25	9.25	12.3
598	ICP-MS	2.82	8.99	7.12	9.39	12.36
599	DRC/CC-ICP-MS	2.80	10.3	7.53	10.3	12.5

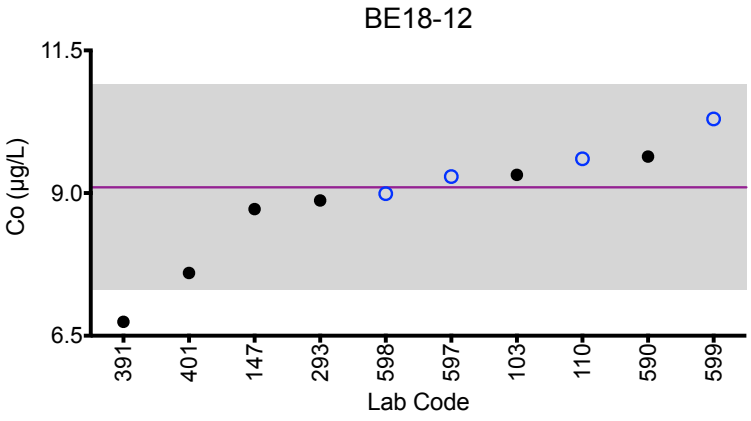
Based on the grading criteria for Co in Whole Blood, 92% of results were satisfactory, with 1 of the 10 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

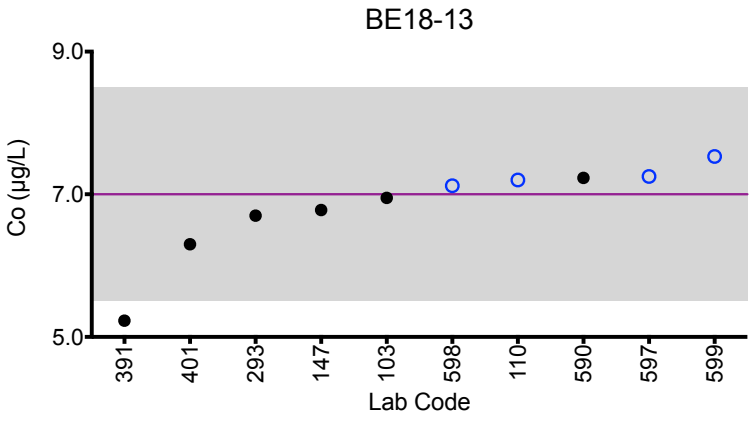
NEW YORK STATE | Department of Health | Wadsworth Center

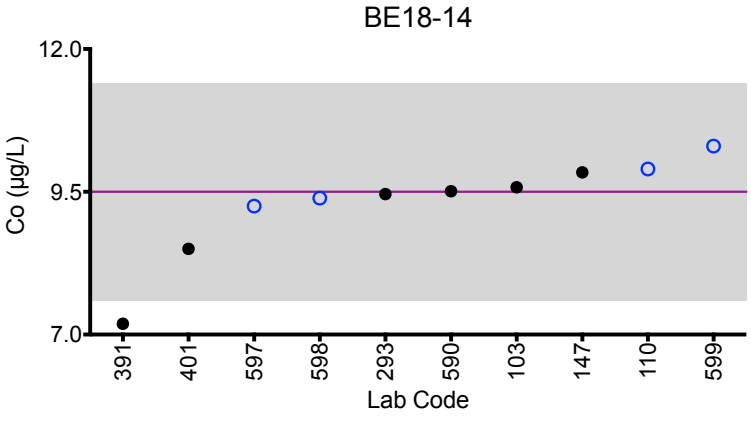
Results for Event #3, 2018: Summary Figures

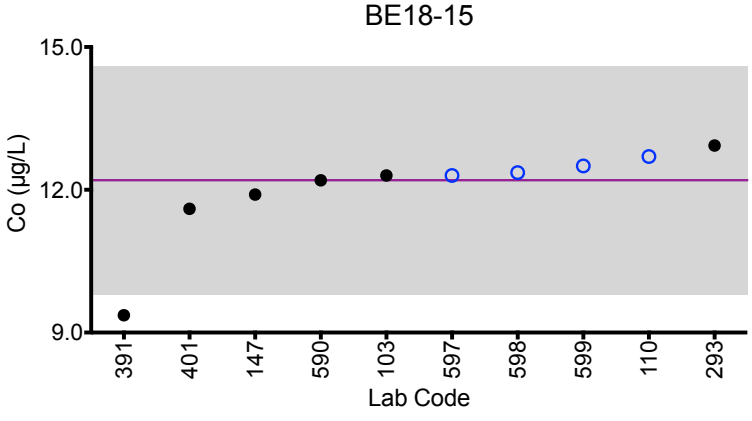
Whole Blood Co











Legend:
o CHEAR 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 ±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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

Whole Blood Cr (µg/L)					
	BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Target (Robust Mean (x*))	15.7	0.7	8.4	12.0	4.6
Upper Limit	18.8	2.7	10.4	14.4	6.6
Lower Limit	12.6	0.0	6.4	9.6	2.6
Robust SD (s*)	0.8	0.1	0.4	1.7	1.3
Robust RSD (%)	5.1	14	4.8	14	28
Number of Sample Measurements (N)	10	6	10	10	10
Standard Uncertainty (*u*)	0.3	NA	0.2	0.7	0.5

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

The target value for BE18-12 was assigned based on the arithmetic mean of the data reported by labs 110, 147, 293, 391, 590, and 598.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Performance of Participating Laboratories

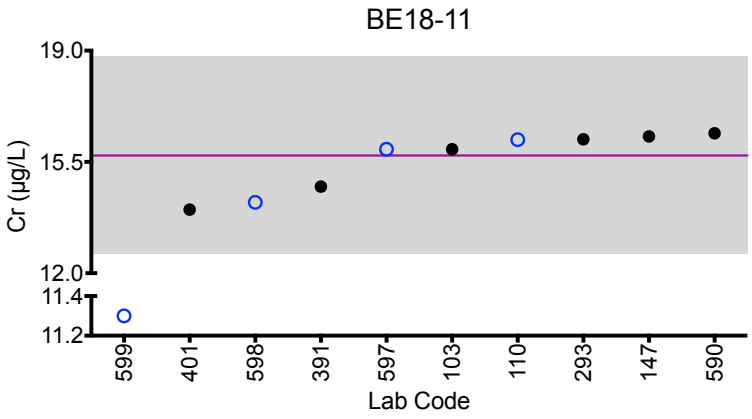
Whole Blood Cr (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
	Target	**15.7**	**0.7**	**8.4**	**12.0**	**4.6**
103	DRC/CC-ICP-MS	15.9	<1.25	8.39	11.9	3.45
110	DRC/CC-ICP-MS	16.2	0.8	9.0	12.1	3.6
147	DRC/CC-ICP-MS	16.3	0.801	8.37	15.3 ↑	3.54
293	DRC/CC-ICP-MS	16.21	0.88	8.56	17.17 ↑	6.98 ↑
391	ICP-MS	14.725	0.697	6.464	8.861 ↓	7.382 ↑
401	DRC/CC-ICP-MS	14.0	*1.6	8.1	10.8	4.2
590	DRC/CC-ICP-MS	16.4	0.765	8.53	12.5	5.05
597	DRC/CC-ICP-MS	15.9	*1.82	10.1	12.4	4.71
598	DRC/CC-ICP-MS	14.23	0.46	7.45	11.16	3.33
599	DRC/CC-ICP-MS	11.3 ↓	*3.05 ↑	8.17	10.8	4.97

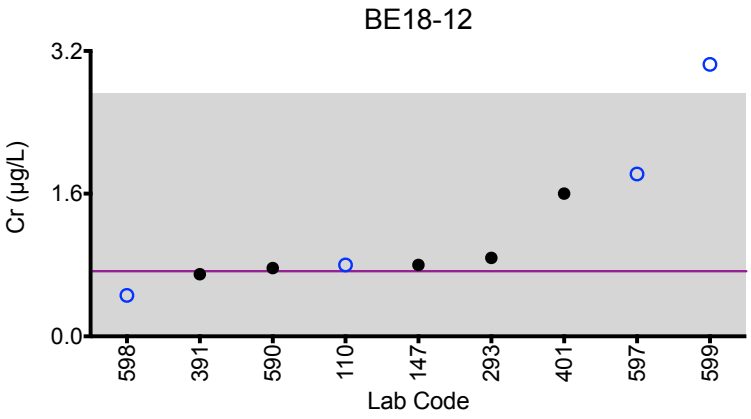
Based on the grading criteria for Cr in Whole Blood, 86% of results were satisfactory, with 3 of the 10 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

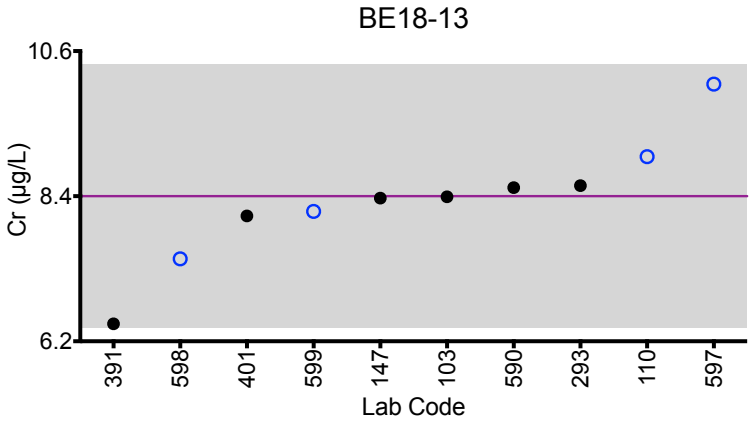
NEW YORK STATE | Department of Health | Wadsworth Center

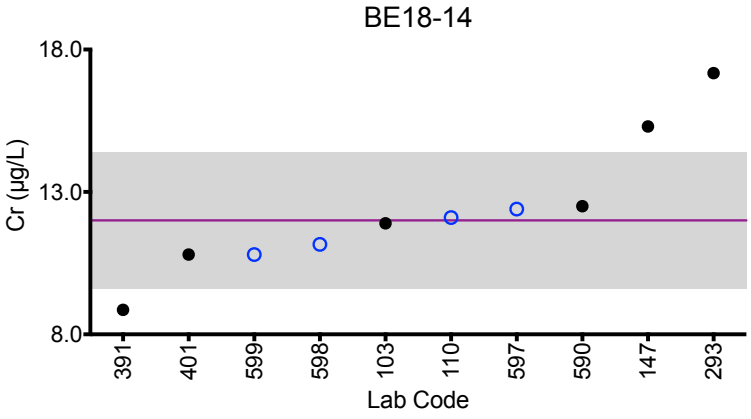
Results for Event #3, 2018: Summary Figures

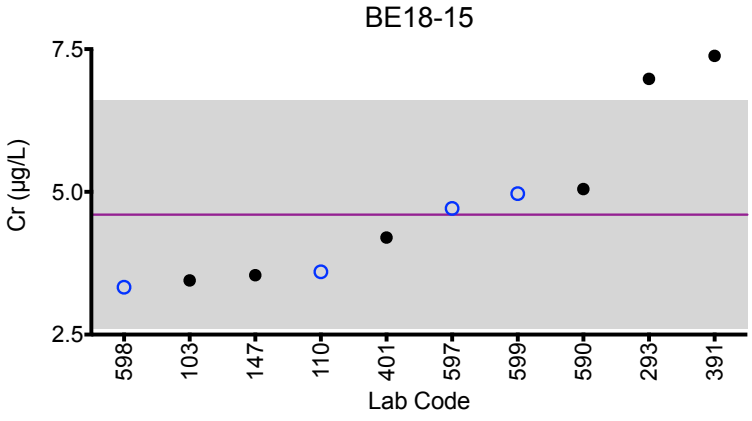
Whole Blood Cr











Legend:

o CHEAR 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/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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

Whole Blood Hg (µg/L)					
	BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Target (Robust Mean (x*))	28.5	1.32	11.8	8.7	22.1
Upper Limit	37.1	4.32	15.3	11.7	28.7
Lower Limit	20.0	0.00	8.3	5.7	15.5
Robust SD (s*)	2.6	0.17	1.2	0.6	2.1
Robust RSD (%)	9.1	13	10	6.9	9.5
Number of Sample Measurements (N)	16	15	16	16	16
Standard Uncertainty (*u*)	0.8	0.06	0.4	0.2	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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Performance of Participating Laboratories

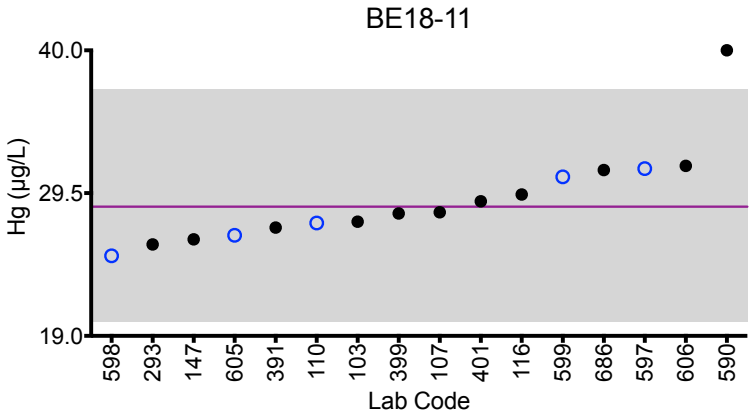
Whole Blood Hg (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
	Target	**28.5**	**1.32**	**11.8**	**8.7**	**22.1**
103	DRC/CC-ICP-MS	27.4	1.35	11.4	8.26	21.3
107	DRC/CC-ICP-MS	28.09	1.31	11.54	8.65	21.92
110	ICP-MS	27.3	1.31	11.5	8.20	20.9
116	ICP-MS/MS	29.4	<1.50	12.9	8.83	22.8
147	ICP-MS	26.1	1.23	10.5	8.04	21.3
293	DRC/CC-ICP-MS	25.73	1.28	10.7	8.16	20.02
391	CV-AAS	26.97	3.206	5.088 ↓	14.58 ↑	18.09
399	DRC/CC-ICP-MS	28.0	1.21	11.8	8.59	22.0
401	DRC/CC-ICP-MS	28.9	1.0	12.6	8.4	22.1
590	CV-AAS	40 ↑	1.33	13.0	9.08	24.0
597	DMA	31.3	1.94	13.4	9.21	24.4
598	ICP-MS	24.89	1.42	11.11	8.02	19.69
599	DRC/CC-ICP-MS	30.7	0.75	11.26	9.11	24.2
605	ICP-MS	26.4	1.2	11	7.96	20.8
606	DRC/CC-ICP-MS	31.5	1.43	13.5	9.3	24.9
686	ICP-MS	31.2	1.45	12.9	9.08	24.5

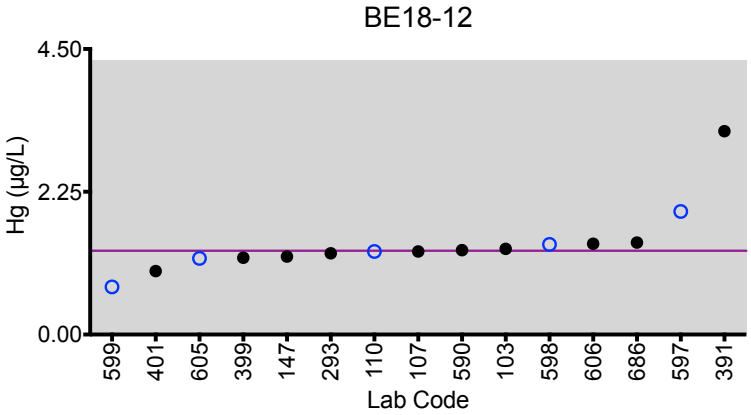
Based on the grading criteria for Hg in Whole Blood, 96% of results were satisfactory, with 1 of the 16 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

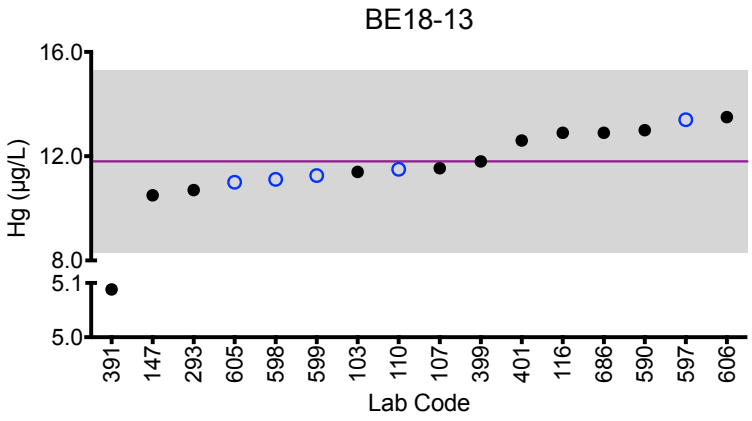
NEW YORK STATE | Department of Health | Wadsworth Center

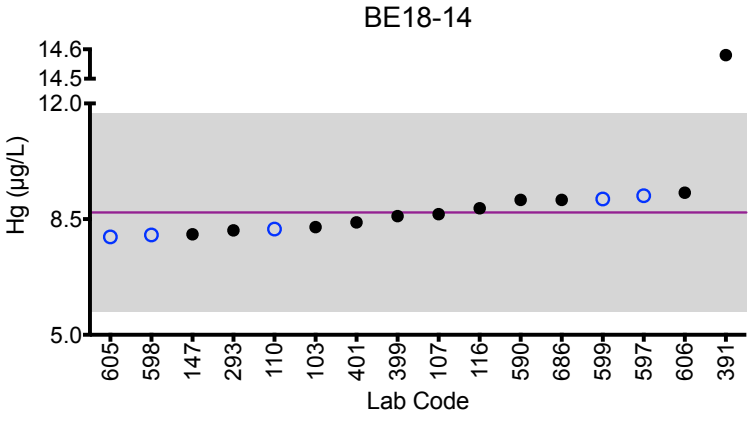
Results for Event #3, 2018: Summary Figures

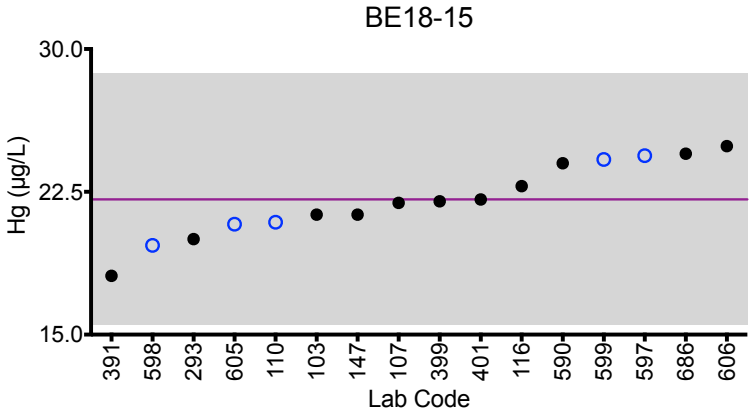
Whole Blood Hg











Legend:

o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

Whole Blood Mn (µg/L)					
	BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Target (Robust Mean (x*))	34.8	21.6	25.4	18.7	28.5
Upper Limit	40.7	25.3	29.7	21.9	33.3
Lower Limit	28.9	17.9	21.1	15.5	23.7
Robust SD (s*)	2.4	2.1	2.0	1.9	1.8
Robust RSD (%)	6.9	9.7	7.9	10	6.3
Number of Sample Measurements (N)	13	13	13	13	13
Standard Uncertainty (*u*)	0.8	0.7	0.7	0.7	0.6

The acceptable range is based on quality specifications:
±3 µg/L or ±17% around the target value, whichever is greater; thus, it is fixed at ±3 µg/L at concentrations less than or equal to 17.7 µg/L. These quality specifications were recently proposed by a network of Trace Element PT program organizers (Praamsma M, et al. An assessment of clinical laboratory performance for the determination of manganese in blood and urine. Clinical Chemistry and Laboratory Medicine. 2016 In press.)

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Performance of Participating Laboratories

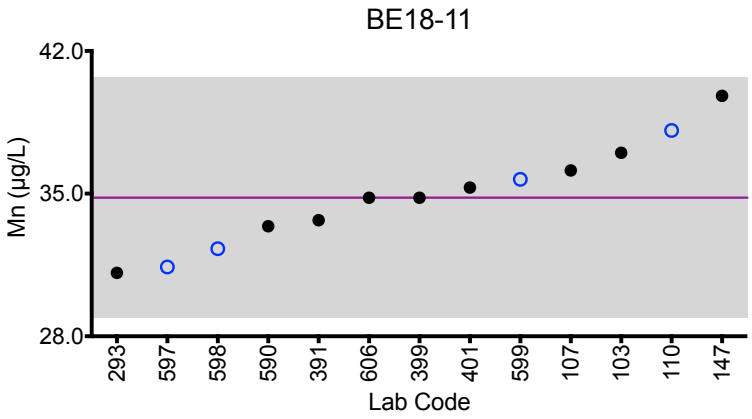
Whole Blood Mn (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
	Target	**34.8**	**21.6**	**25.4**	**18.7**	**28.5**
103	DRC/CC-ICP-MS	37.0	23.2	26.6	19.2	29.4
107	DRC/CC-ICP-MS	36.14	22.87	26.27	19.41	29.15
110	ICP-MS	38.1	23.8	28.1	20.6	30.7
147	ICP-MS	39.8	24.1	29.0	23.5 ↑	34.0 ↑
293	DRC/CC-ICP-MS	31.11	19.16	22.56	16.21	26.09
391	ICP-MS	33.698	19.552	23.339	16.629	26.669
399	DRC/CC-ICP-MS	34.8	21.7	25.3	18.5	28.3
401	DRC/CC-ICP-MS	35.3	23.3	26.2	19.8	29.1
590	DRC/CC-ICP-MS	33.4	21.7	23.8	17.9	27.1
597	DRC/CC-ICP-MS	31.4	19.7	25.1	17.4	27.1
598	ICP-MS	32.3	18.9	23.3	16.6	27.3
599	DRC/CC-ICP-MS	35.7	22.2	25.6	20.9	29.8
606	DRC/CC-ICP-MS	34.8	21.2	25.3	18.2	28.9

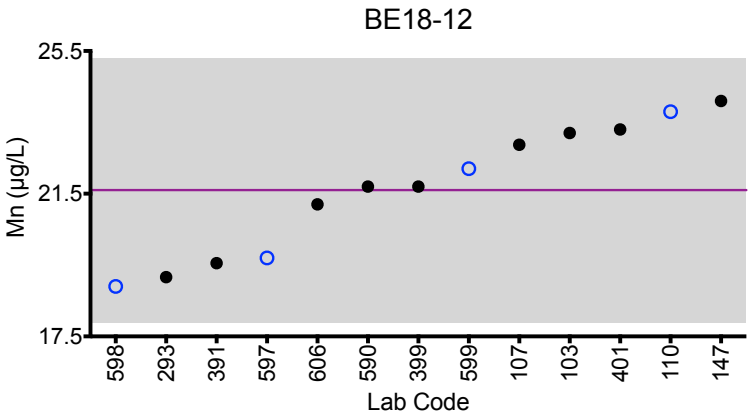
Based on the grading criteria for Mn in Whole Blood, 97% of results were satisfactory, with 1 of the 13 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

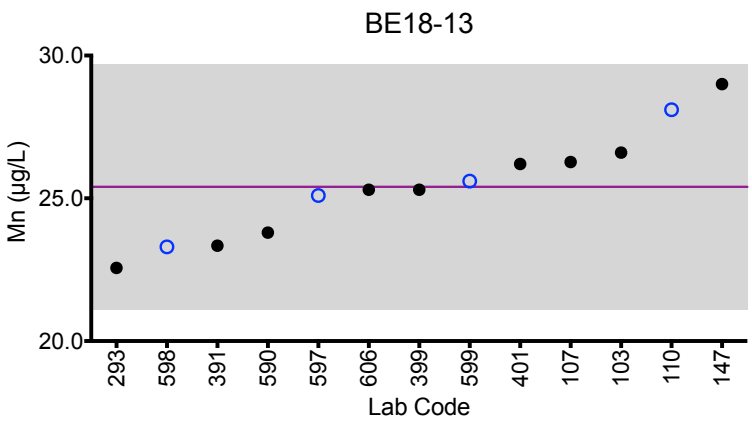
NEW YORK STATE | Department of Health | Wadsworth Center

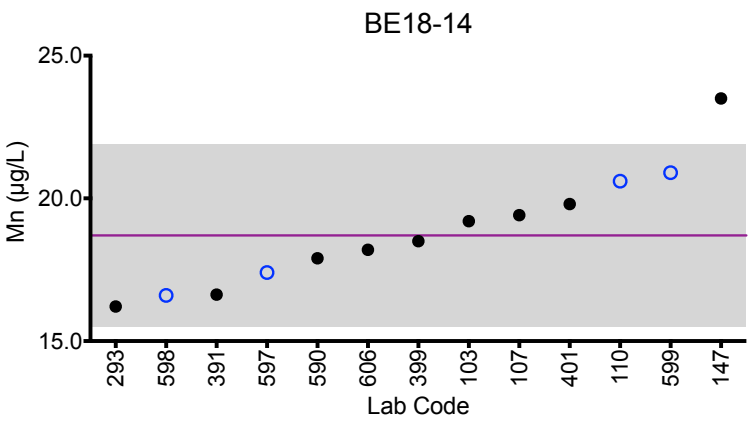
Results for Event #3, 2018: Summary Figures

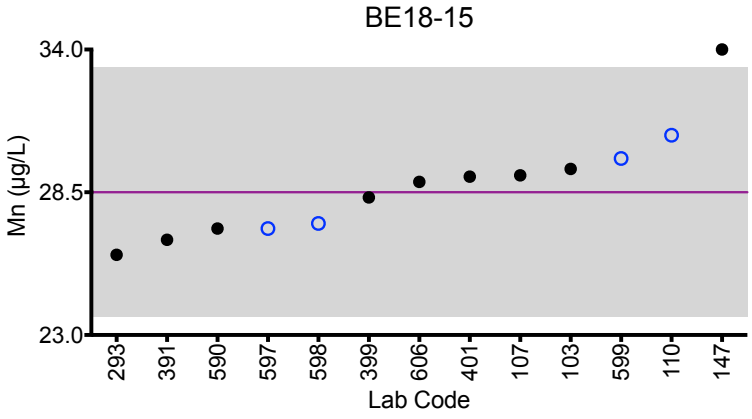
Whole Blood Mn











Legend:

o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

Whole Blood Pb (µg/dL)					
	BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Target (Robust Mean (x*))	0.832	2.05	4.24	2.23	3.55
Upper Limit	2.832	4.05	6.24	4.23	5.55
Lower Limit	0.000	0.05	2.24	0.23	1.55
Robust SD (s*)	0.041	0.20	0.32	0.13	0.25
Robust RSD (%)	4.9	9.8	7.5	5.8	7.0
Number of Sample Measurements (N)	13	17	18	16	18
Standard Uncertainty (*u*)	0.010	0.06	0.10	0.04	0.07

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

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Performance of Participating Laboratories

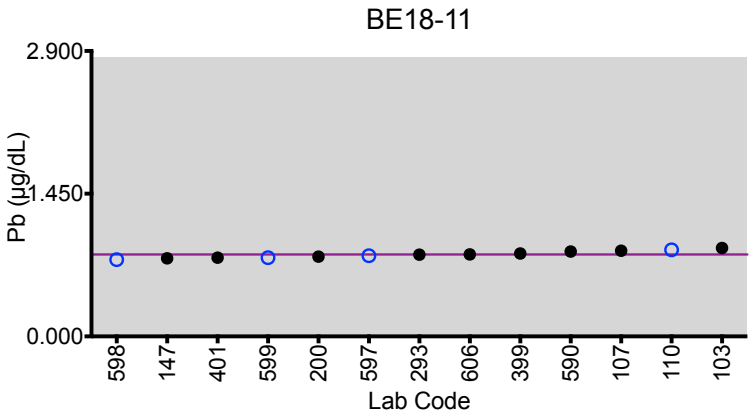
Whole Blood Pb (µg/dL)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
	Target	**0.832**	**2.05**	**4.24**	**2.23**	**3.55**
103	DRC/CC-ICP-MS	0.898	2.23	4.54	2.39	3.87
107	ICP-MS	0.87	2.21	4.27	2.37	3.66
110	ICP-MS	0.88	2.14	4.41	2.24	3.57
116	ICP-MS/MS	<3.00	<3.00	4.45	<3.00	3.79
147	ICP-MS	0.794	1.91	3.94	2.28	3.46
200	ICP-MS	0.81	2.28	4.76	2.69	3.93
293	DRC/CC-ICP-MS	0.83	2.07	4.34	2.27	3.72
343	ASV-LeadCare	<1.9	2.6	4.7	<1.9	2.2
391	ETAAS-Z	<0.50	0.57	2.28	0.55	1.79
399	DRC/CC-ICP-MS	0.842	2.10	4.22	2.29	3.60
401	DRC/CC-ICP-MS	0.8	1.7	3.9	2.1	3.3
590	DRC/CC-ICP-MS	0.863	2.06	4.03	2.15	3.42
597	DRC/CC-ICP-MS	0.82	2.0	4.43	2.18	3.50
598	ICP-MS	0.78	1.84	3.85	2.05	3.28
599	DRC/CC-ICP-MS	0.80	1.91	3.97	2.15	3.42
605	ICP-MS	<1.00	1.98	4.08	2.19	3.52
606	DRC/CC-ICP-MS	0.833	2.13	4.33	2.28	3.69
686	ICP-MS	<1.00	2.17	4.32	2.30	3.80

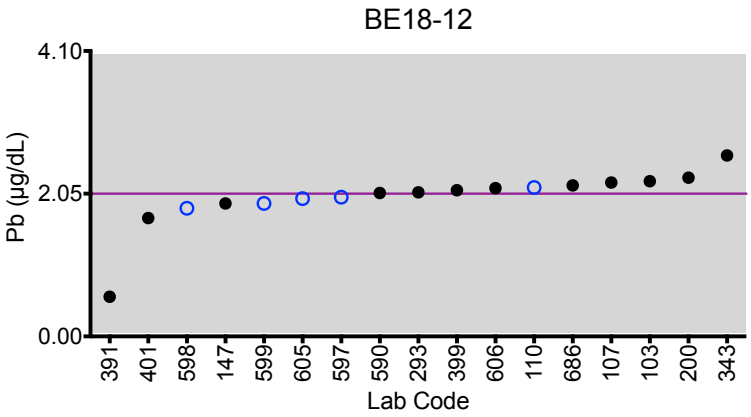
Based on the grading criteria for Pb in Whole Blood, 100% of results were satisfactory, with 0 of the 18 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

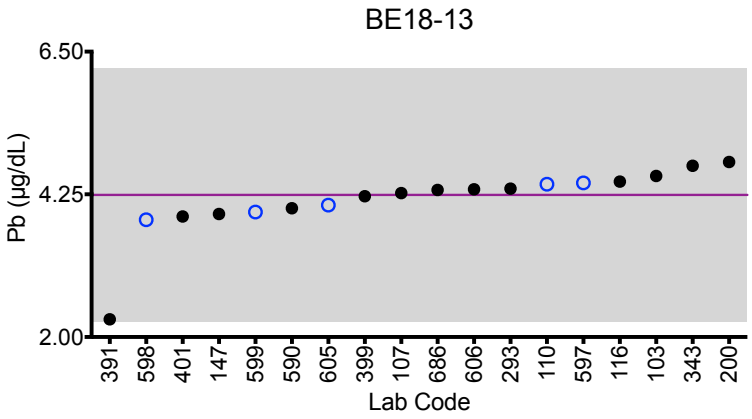
NEW YORK STATE | Department of Health | Wadsworth Center

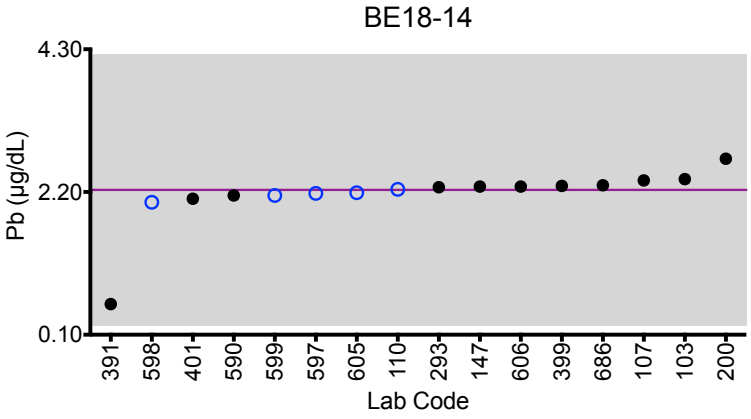
Results for Event #3, 2018: Summary Figures

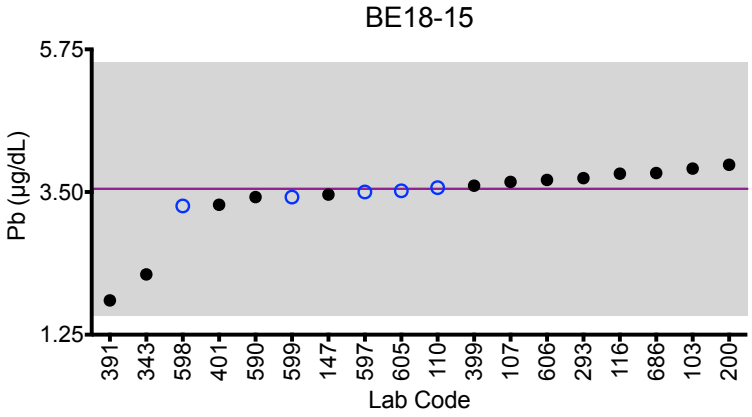
Whole Blood Pb











Legend:

o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

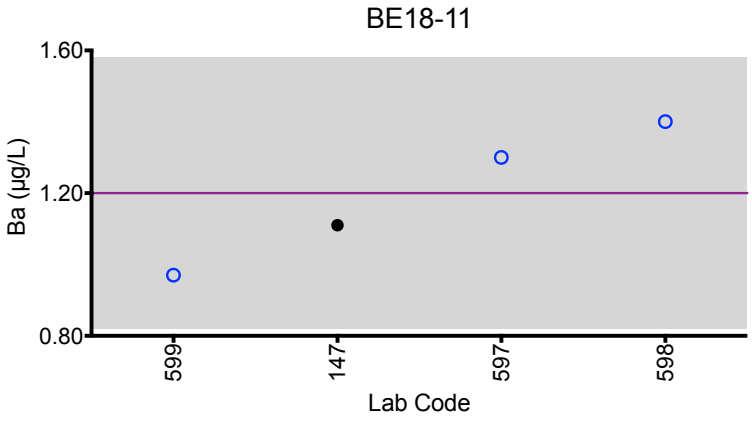
Whole Blood Ba (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
110	ICP-MS	<1.6	10.5	4.2	7.6	<1.6
147	ICP-MS	1.11	10.3	4.00	8.30	1.37
597	DRC/CC-ICP-MS	1.30	10.52	4.17	8.01	2.00
598	ICP-MS	1.400486	11.35958	4.556419	8.850707	1.651311
599	DRC/CC-ICP-MS	0.97	10.9	4.35	8.78	1.41
Summary Statistics						
		BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Arithmetic Mean ($\bar{x}$)		1.20	10.7	4.26	8.3	1.61
Arithmetic SD (s)		0.19	0.4	0.21	0.5	0.29
Arithmetic RSD (%)		16	3.7	4.9	6.0	18
Number of Sample Measurements (N)		4	5	5	5	4

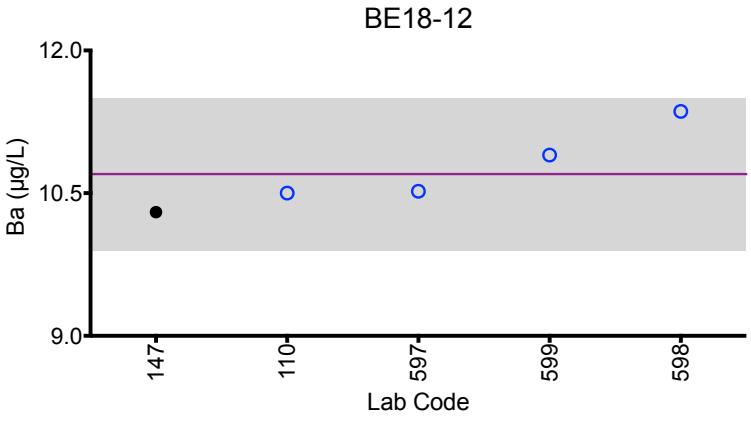
*Denotes a statistical Outlier.

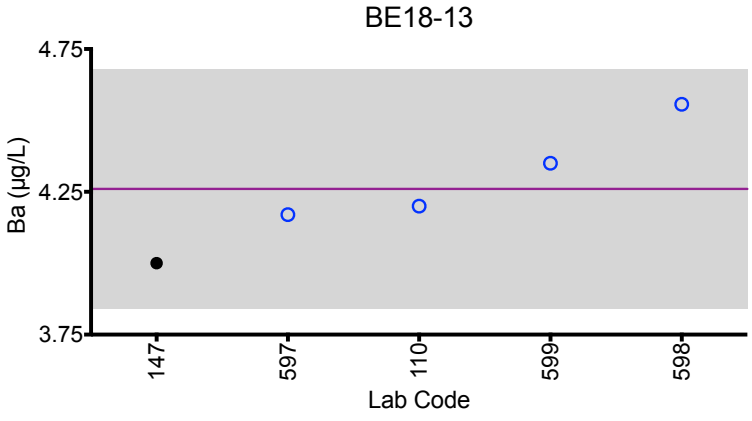
NEW YORK STATE | Department of Health | Wadsworth Center

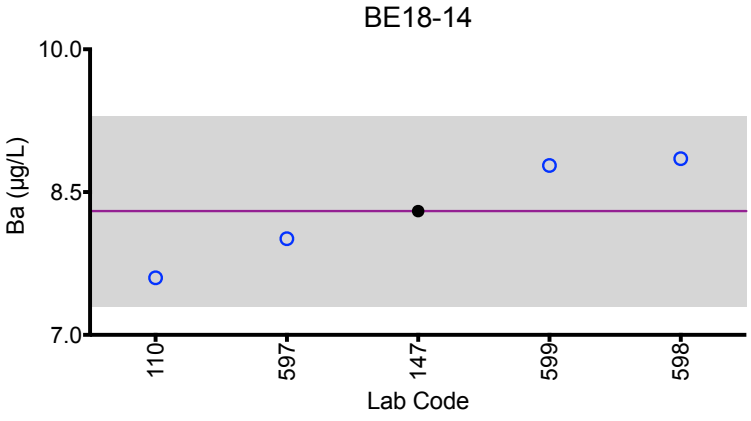
Results for Event #3, 2018: Summary Figures

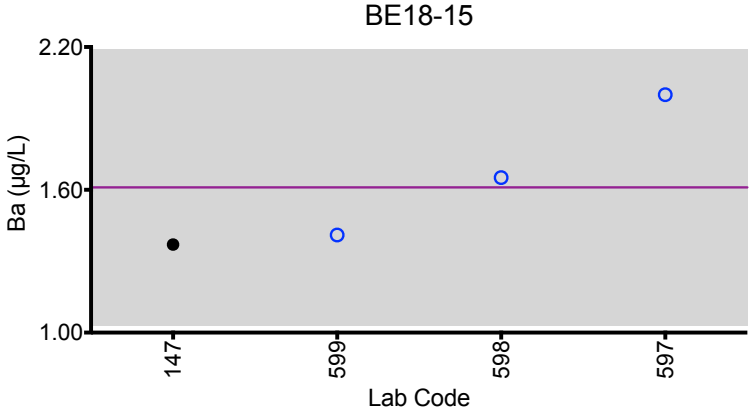
Whole Blood Ba











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

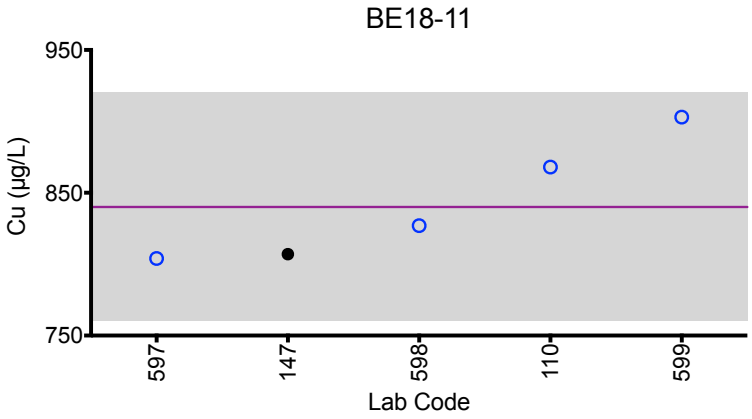
Whole Blood Cu (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
110	ICP-MS	868	1670	2280	1790	1050
147	ICP-MS	807	1474	2039	1792	966
597	DRC/CC-ICP-MS	804	1570	2290	1740	1000
598	ICP-MS	827	1565	2192	1750	1024
599	DRC/CC-ICP-MS	903	1560	2200	1780	985
Summary Statistics						
		BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Arithmetic Mean ($\bar{x}$)		840	1570	2200	1770	1005
Arithmetic SD (s)		40	70	100	24	33
Arithmetic RSD (%)		4.8	4.5	4.5	1.4	3.3
Number of Sample Measurements (N)		5	5	5	5	5

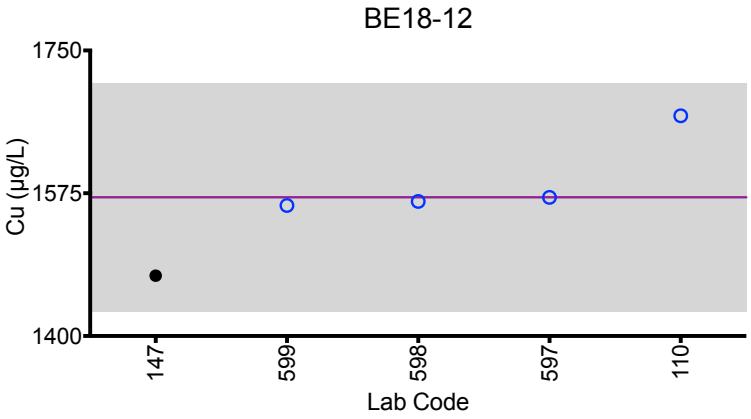
*Denotes a statistical Outlier.

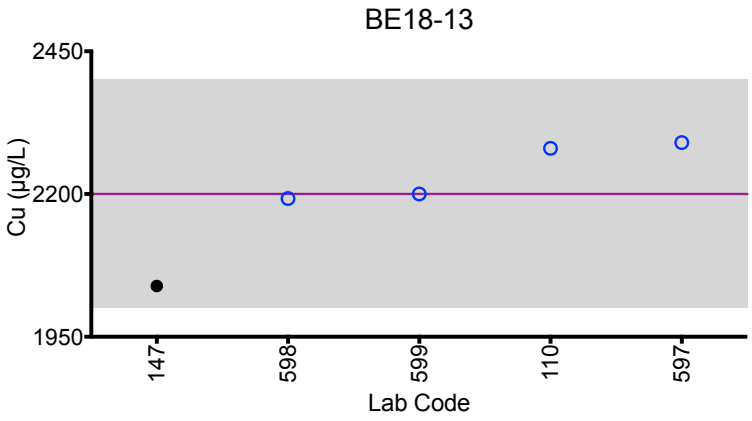
NEW YORK STATE | Department of Health | Wadsworth Center

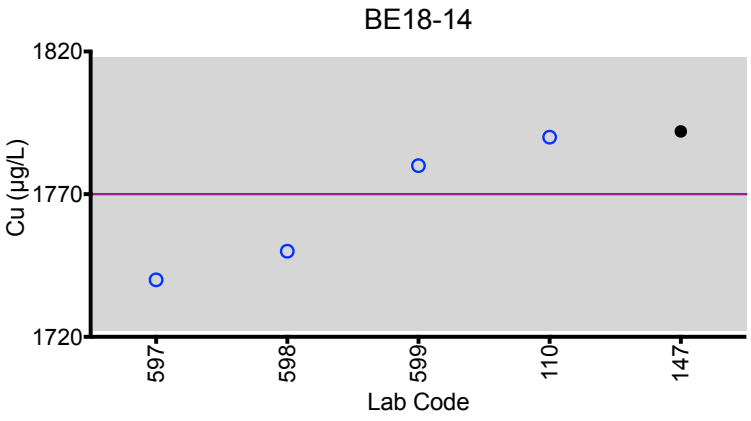
Results for Event #3, 2018: Summary Figures

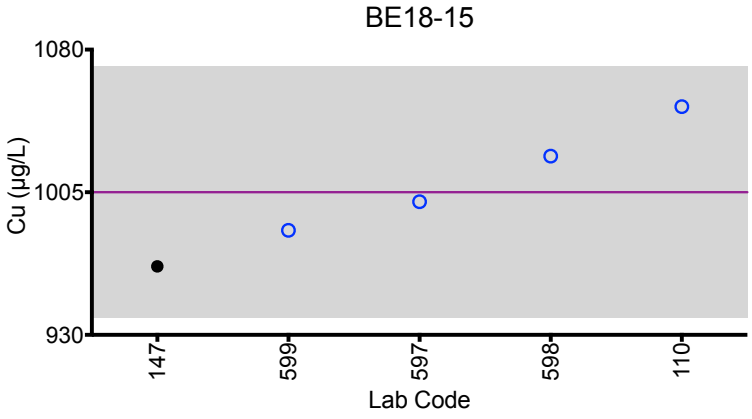
Whole Blood Cu











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

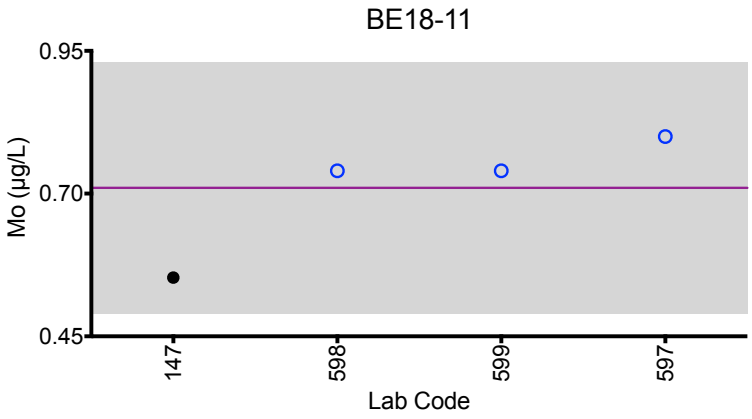
Whole Blood Mo (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
103	DRC/CC-ICP-MS	< 0.750	10.9	8.08	3.49	< 0.750
147	ICP-MS	0.553	9.24	7.12	3.37	0.584
597	DRC/CC-ICP-MS	0.80	9.55	7.74	3.25	0.795
598	DRC/CC-ICP-MS	0.74	9.73	7.57	3.04	0.58
599	DRC/CC-ICP-MS	0.74	9.78	8.29	3.54	0.71
Summary Statistics						
		BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Arithmetic Mean ($\bar{x}$)		0.71	9.8	7.8	3.34	0.67
Arithmetic SD (s)		0.11	0.6	0.5	0.20	0.10
Arithmetic RSD (%)		15	6.1	6.4	6.0	15
Number of Sample Measurements (N)		4	5	5	5	4

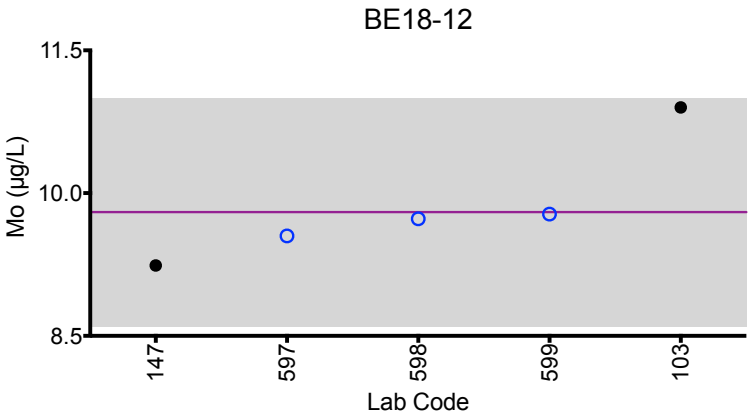
*Denotes a statistical Outlier.

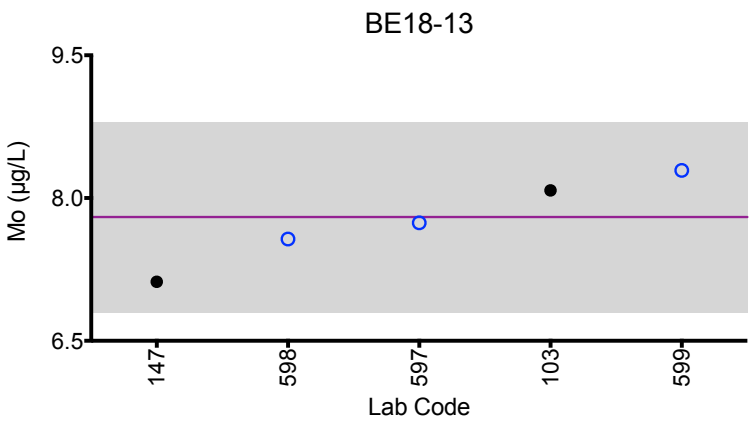
NEW YORK STATE | Department of Health | Wadsworth Center

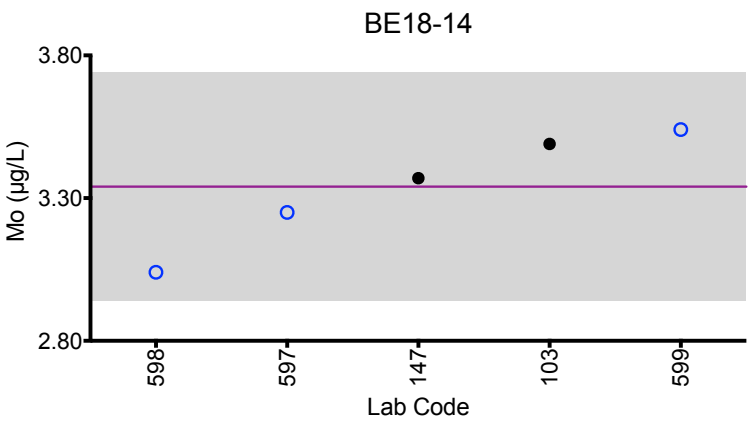
Results for Event #3, 2018: Summary Figures

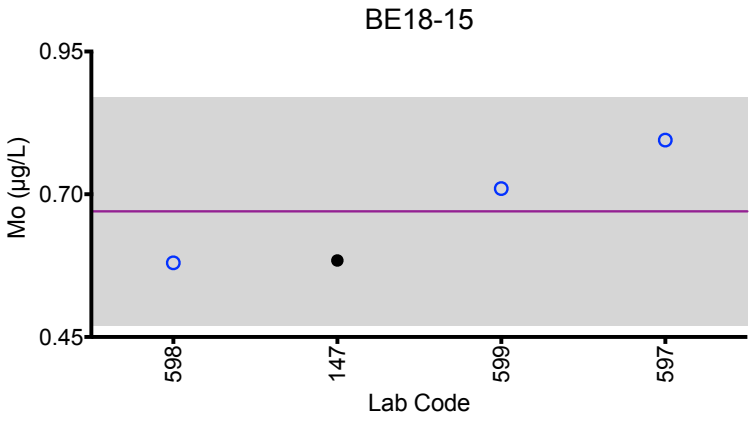
Whole Blood Mo











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

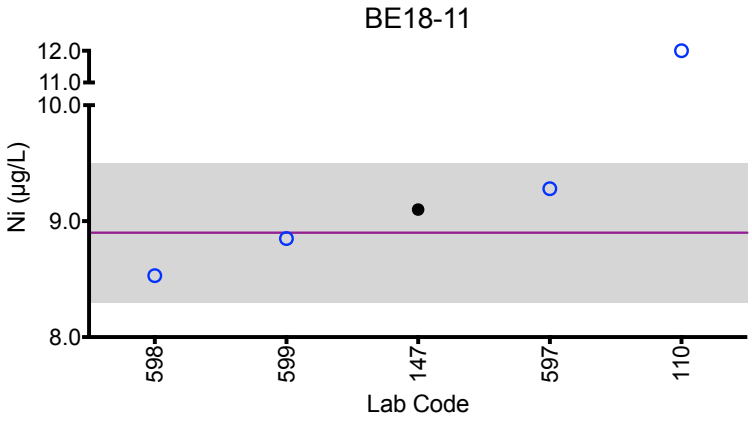
Results for Event #3, 2018:
Laboratory Data and Summary Statistics

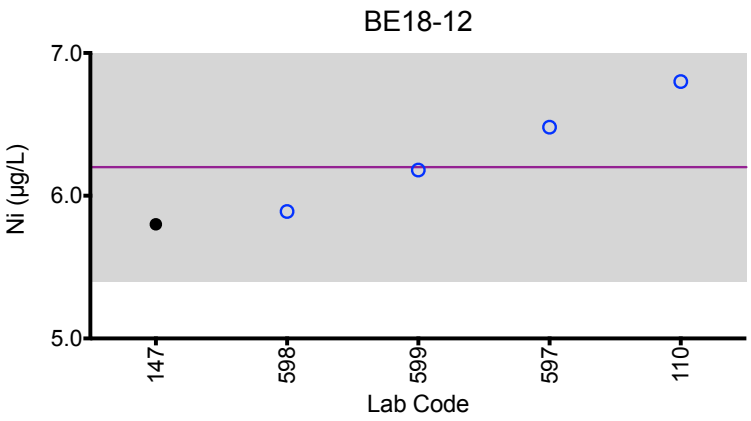
Whole Blood Ni (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
110	DRC/CC-ICP-MS	*12.0	6.8	6.3	13.8	2.2
147	ICP-MS	9.10	5.80	4.93	13.0	1.63
597	DRC/CC-ICP-MS	9.28	6.48	5.48	11.6	2.09
598	ICP-MS	8.53	5.89	4.60	11.91	1.10
599	DRC/CC-ICP-MS	8.85	6.18	5.11	11.8	1.68
Summary Statistics						
		BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Arithmetic Mean ($\bar{x}$)		8.9	6.2	5.3	12.4	1.7
Arithmetic SD (s)		0.3	0.4	0.7	0.9	0.4
Arithmetic RSD (%)		3.4	6.5	13	7.3	24
Number of Sample Measurements (N)		4	5	5	5	5

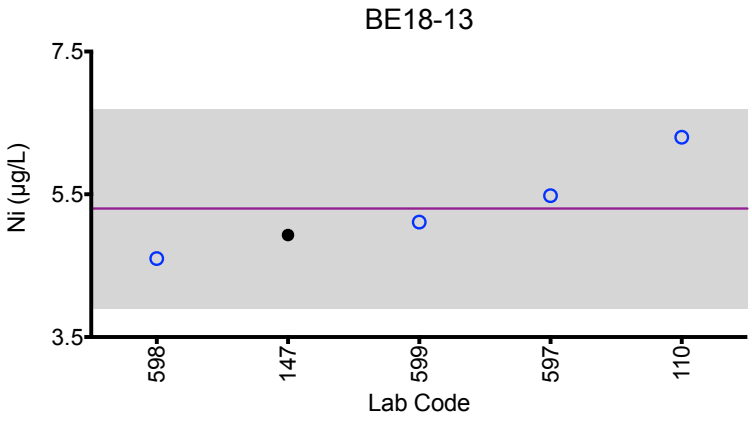
*Denotes a statistical Outlier.

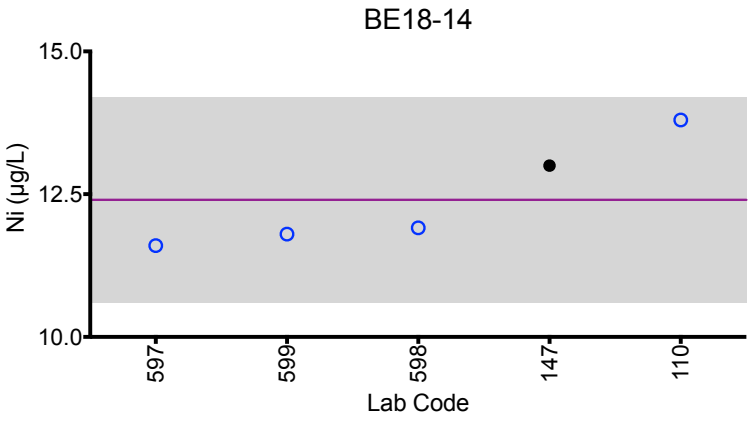
Results for Event #3, 2018: Summary Figures

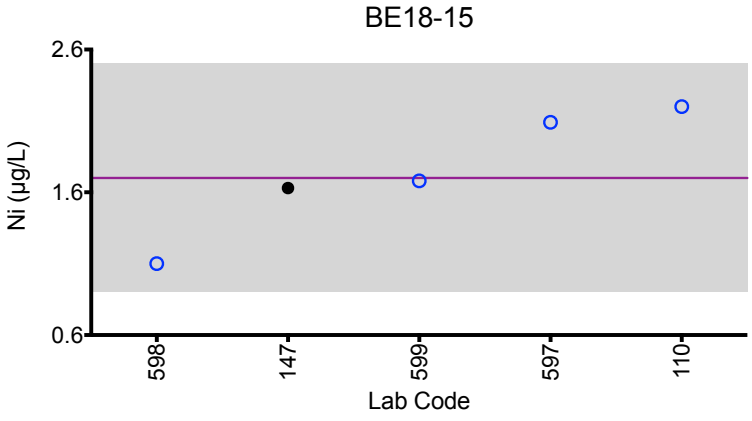
Whole Blood Ni











Legend:
o CHEAR 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.

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Whole Blood Sb (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
103	DRC/CC-ICP-MS	< 0.0750	1.58	3.79	2.55	< 0.0750
110	ICP-MS	0.02	1.55	3.74	2.38	<0.02
147	ICP-MS	1.27	1.27	3.13	2.25	< 0.0548
293	DRC/CC-ICP-MS	0.07	1.41	3.64	2.19	0.01
597	DRC/CC-ICP-MS	0.070	1.43	3.64	2.11	0.091
598	ICP-MS	<0.01	1.47	3.66	2.42	<0.01
Summary Statistics						
		BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Arithmetic Mean ($\bar{x}$)		NA	1.45	3.60	2.32	NA
Arithmetic SD (s)		NA	0.11	0.23	0.16	NA
Arithmetic RSD (%)		NA	7.6	6.7	6.9	NA
Number of Sample Measurements (N)		NA	6	6	6	NA

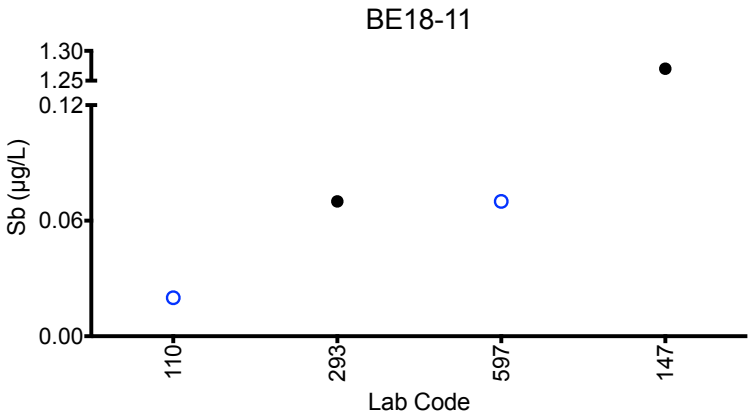
*Denotes a statistical Outlier.

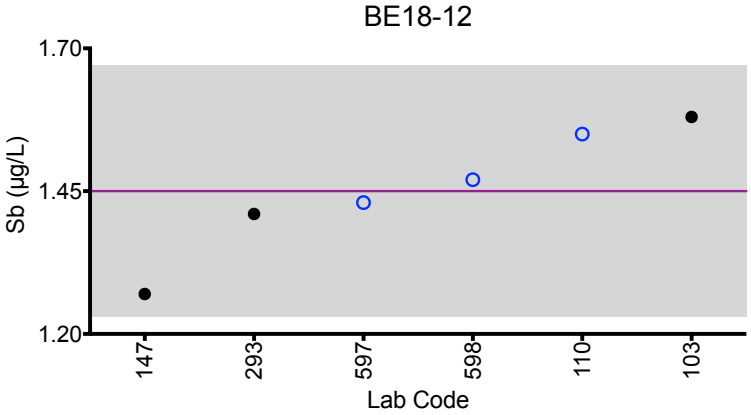
Statistical data were not calculated for BE18-11 or BE18-15 based on a lack of consensus among participating labs.

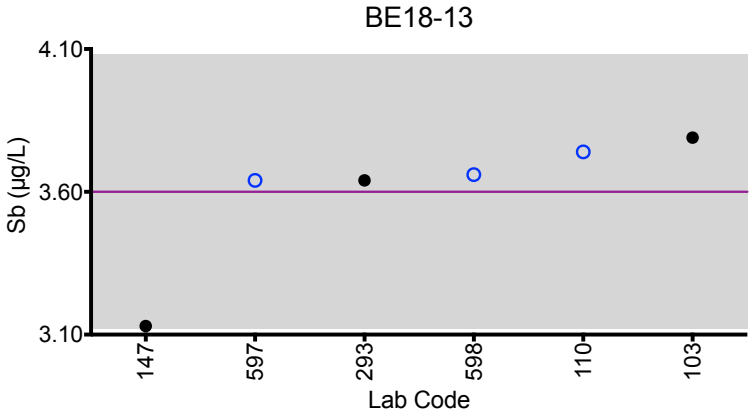
NEW YORK STATE | Department of Health | Wadsworth Center

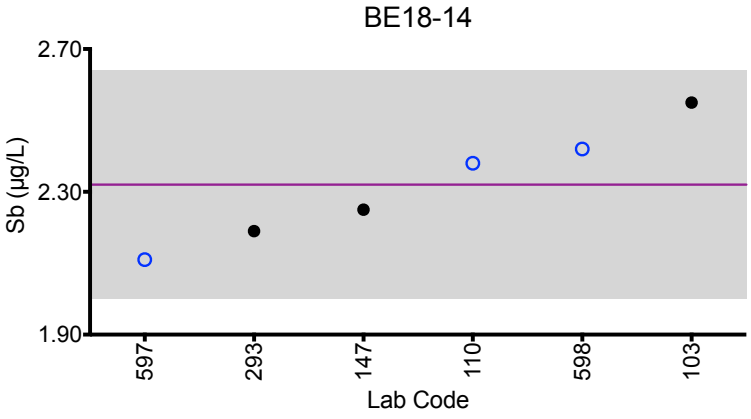
Results for Event #3, 2018: Summary Figures

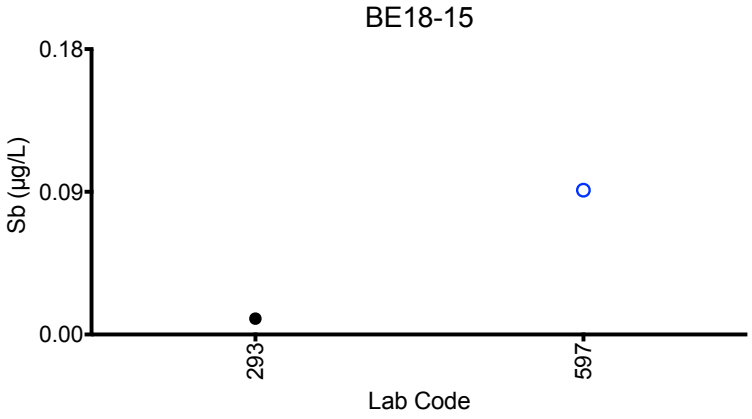
Whole Blood Sb











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

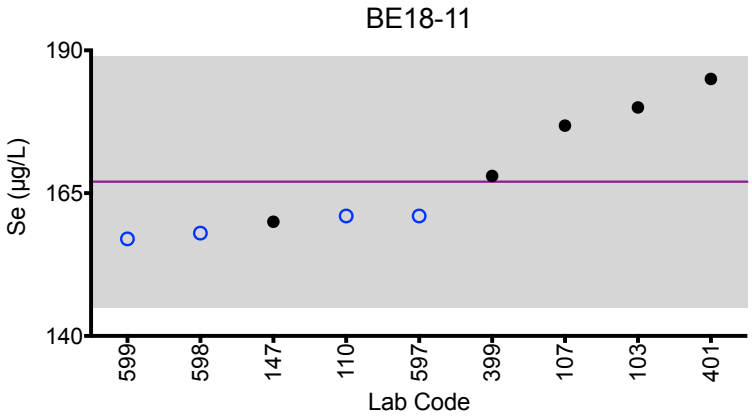
Whole Blood Se (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
103	DRC/CC-ICP-MS	180	285	123	398	308
107	DRC/CC-ICP-MS	176.83	292.02	121.97	408.23	302.84
110	DRC/CC-ICP-MS	161	252	111	360	275
147	ICP-MS	160	238	103	371	268
399	DRC/CC-ICP-MS	168	270	116	383	297
401	DRC/CC-ICP-MS	185	290	125	430	*355
597	DRC/CC-ICP-MS	161	271	*195	373	303
598	DRC/CC-ICP-MS	158	250	119	361	284
599	DRC/CC-ICP-MS	157	269	116	401	300
Summary Statistics						
		BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Arithmetic Mean ($\bar{x}$)		167	269	117	387	292
Arithmetic SD (s)		11	19	7	24	15
Arithmetic RSD (%)		6.6	7.1	6.0	6.2	5.1
Number of Sample Measurements (N)		9	9	8	9	8

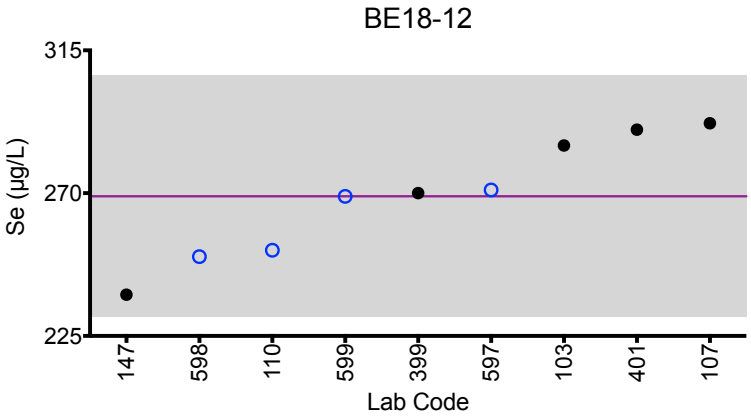
*Denotes a statistical Outlier.

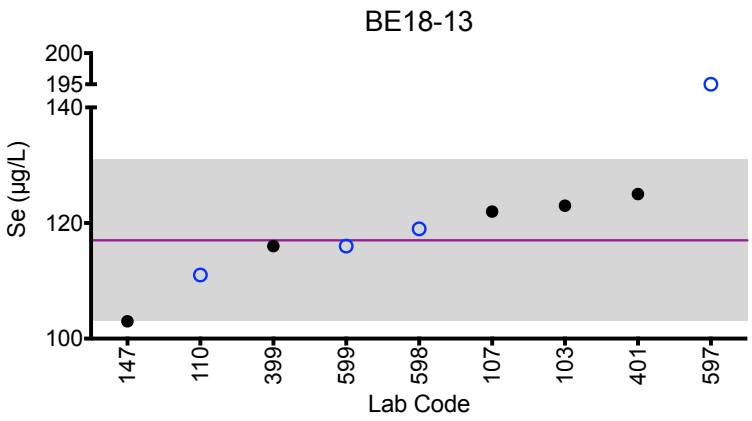
NEW YORK STATE | Department of Health | Wadsworth Center

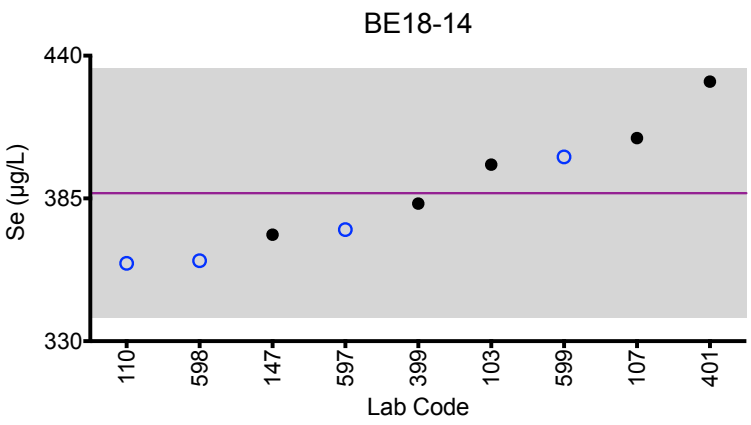
Results for Event #3, 2018: Summary Figures

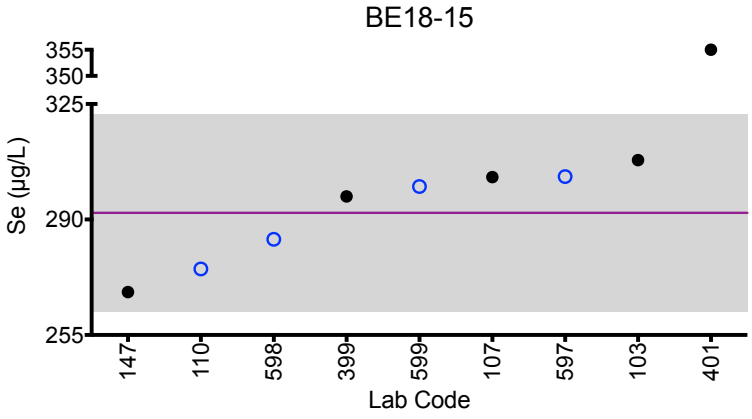
Whole Blood Se











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

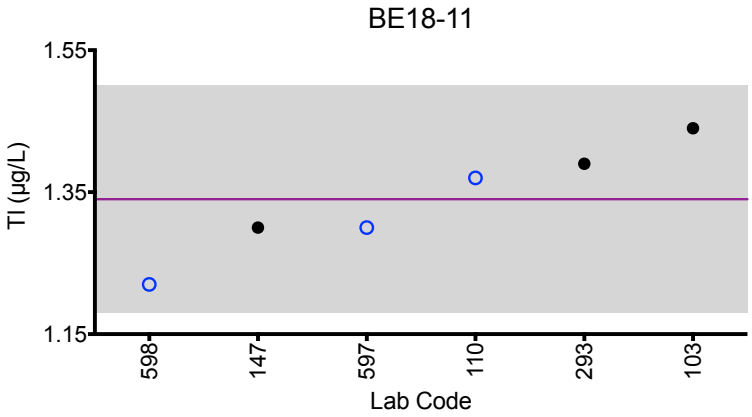
Results for Event #3, 2018: Laboratory Data and Summary Statistics

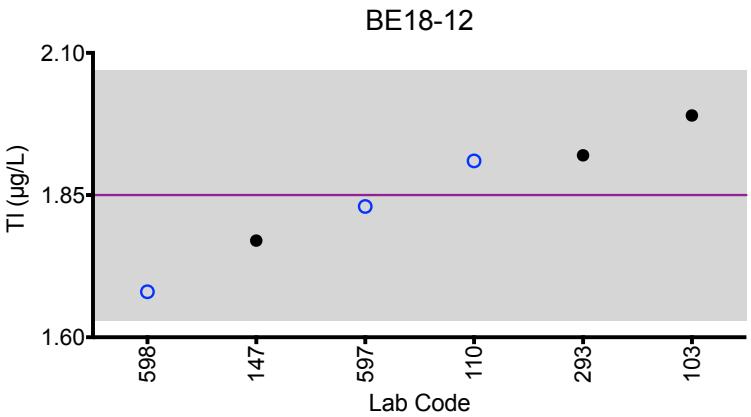
Whole Blood Tl (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
103	DRC/CC-ICP-MS	1.44	1.99	0.983	0.0303	0.641
110	ICP-MS	1.37	1.91	0.94	0.03	0.61
147	ICP-MS	1.30	1.77	0.859	< 0.0388	0.581
293	DRC/CC-ICP-MS	1.39	1.92	0.9	0.02	0.55
597	DRC/CC-ICP-MS	1.30	1.83	0.947	0.046	0.609
598	ICP-MS	1.22	1.68	0.87	0.04	0.57
Summary Statistics						
		BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Arithmetic Mean ($\bar{x}$)		1.34	1.85	0.92	0.033	0.594
Arithmetic SD (s)		0.08	0.11	0.05	0.010	0.033
Arithmetic RSD (%)		6.0	5.9	5.4	30	5.6
Number of Sample Measurements (N)		6	6	6	5	6

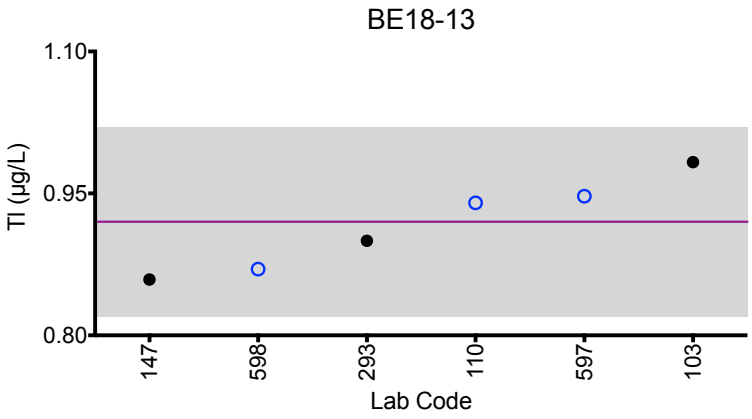
*Denotes a statistical Outlier.

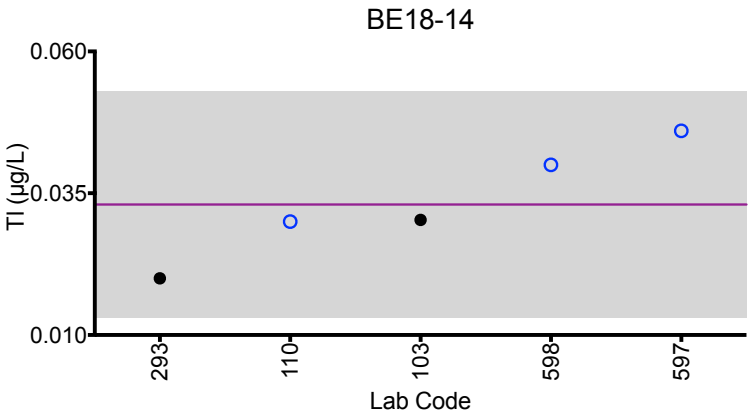
Results for Event #3, 2018: Summary Figures

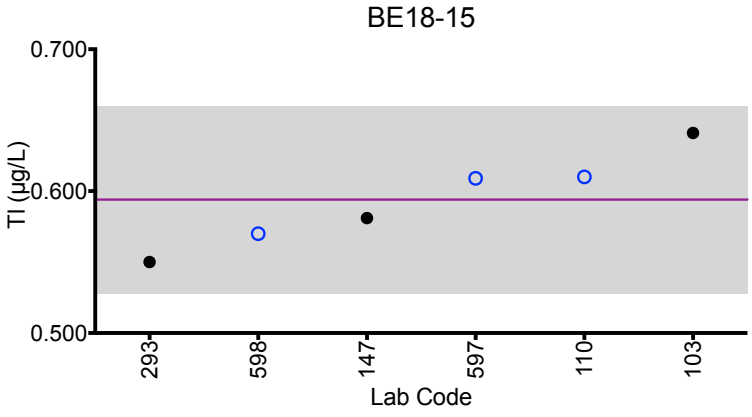
Whole Blood Tl











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

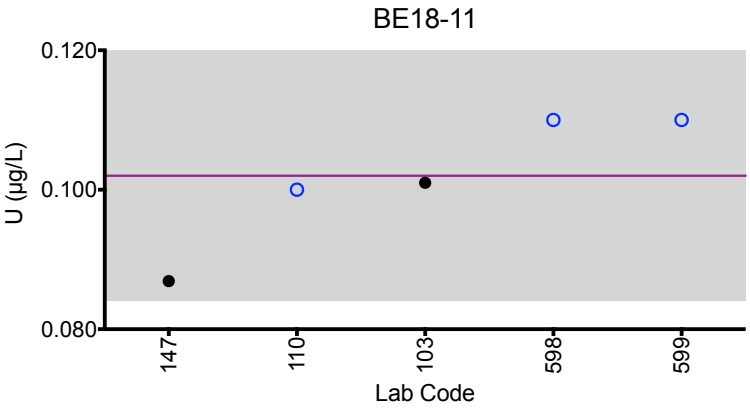
Results for Event #3, 2018:
Laboratory Data and Summary Statistics

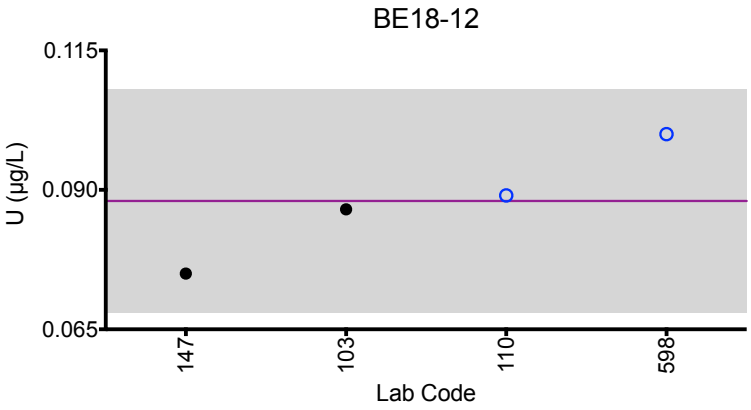
Whole Blood U (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
103	DRC/CC-ICP-MS	0.101	0.0865	< 0.0250	< 0.0250	0.0574
110	ICP-MS	0.100	0.089	0.024	0.020	0.061
147	ICP-MS	0.0869	0.0750	< 0.0200	< 0.0200	0.0605
598	ICP-MS	0.11	0.10	0.03	0.03	0.06
599	DRC/CC-ICP-MS	0.11	<0.1	<0.1	<0.1	*0.10
Summary Statistics						
		BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Arithmetic Mean ($\bar{x}$)		0.102	0.088	0.027	0.025	0.0597
Arithmetic SD (s)		0.009	0.010	0.004	0.007	0.0016
Arithmetic RSD (%)		8.8	11	15	28	2.7
Number of Sample Measurements (N)		5	4	2	2	4

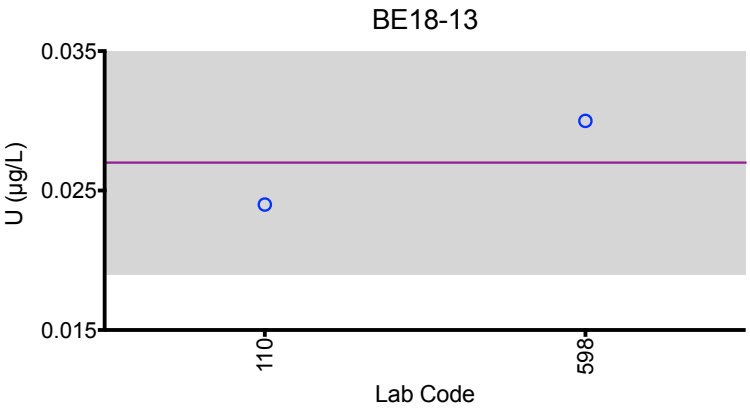
*Denotes a statistical Outlier.

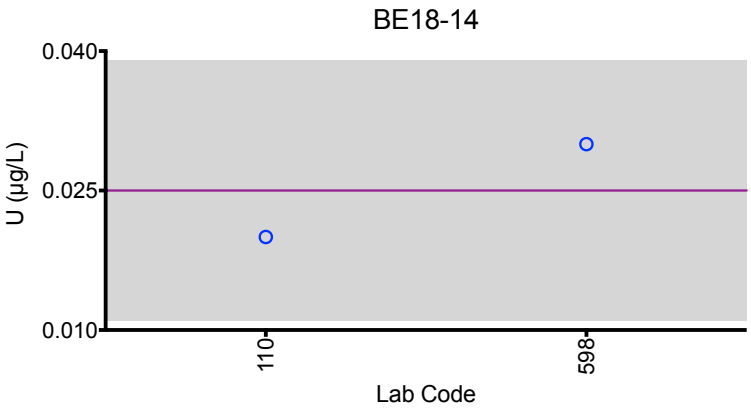
Results for Event #3, 2018: Summary Figures

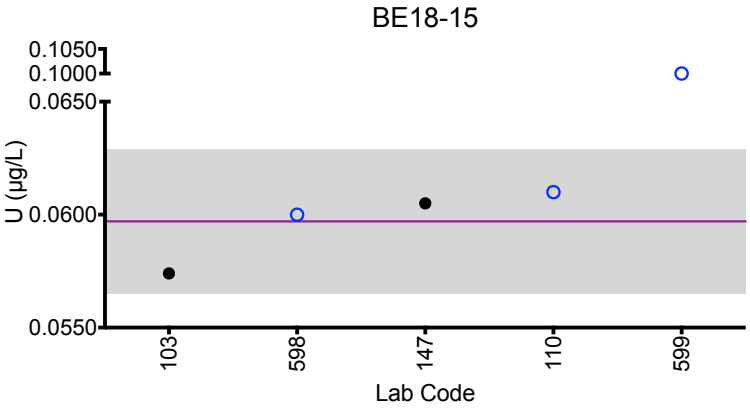
Whole Blood U











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

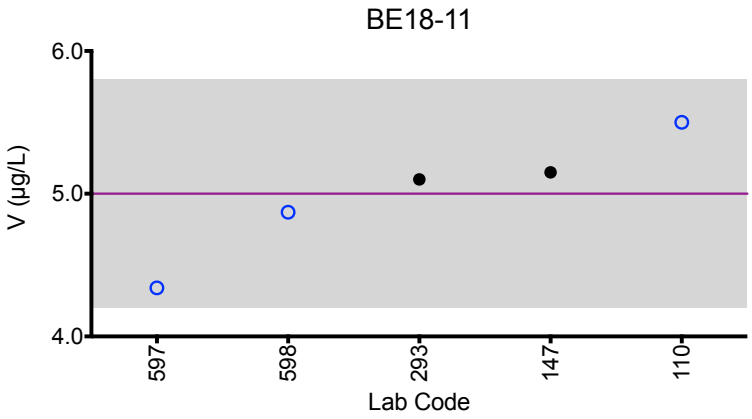
Results for Event #3, 2018:
Laboratory Data and Summary Statistics

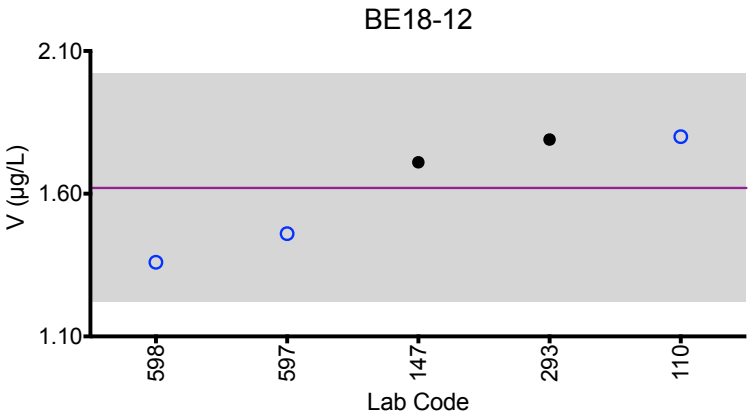
Whole Blood V (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
110	DRC/CC-ICP-MS	5.5	1.8	4.2	0.7	0.4
147	DRC/CC-ICP-MS	5.15	1.71	3.85	0.587	0.373
293	DRC/CC-ICP-MS	5.1	1.79	3.92	0.61	0.44
597	DRC/CC-ICP-MS	4.34	1.46	3.60	0.498	0.392
598	DRC/CC-ICP-MS	4.87	1.36	3.52	0.47	0.32
Summary Statistics						
		BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Arithmetic Mean ($\bar{x}$)		5.0	1.62	3.82	0.57	0.39
Arithmetic SD (s)		0.4	0.20	0.27	0.09	0.04
Arithmetic RSD (%)		8.0	12	7.1	16	10
Number of Sample Measurements (N)		5	5	5	5	5

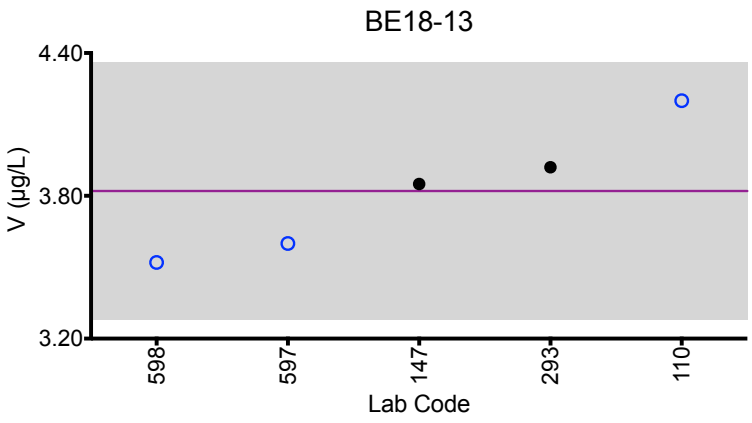
*Denotes a statistical Outlier.

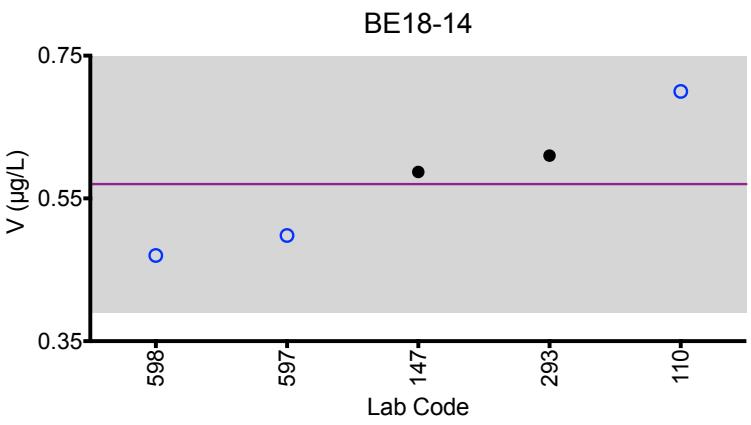
Results for Event #3, 2018: Summary Figures

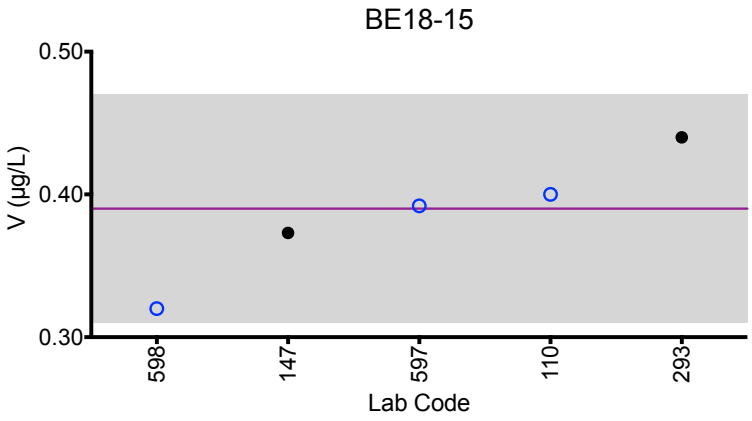
Whole Blood V











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

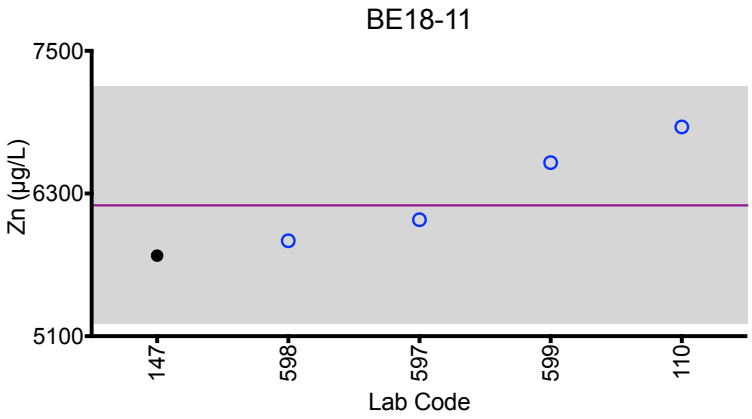
Whole Blood Zn (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
110	ICP-MS	6860	7610	8710	5600	7530
147	ICP-MS	5778	6111	6863	4882	6203
597	DRC/CC-ICP-MS	6080	6930	8270	5160	6980
598	ICP-MS	5903	6551	7545	4885	6665
599	DRC/CC-ICP-MS	6560	7190	8340	5460	7220
Summary Statistics						
		BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Arithmetic Mean ($\bar{x}$)		6200	6900	7900	5200	6900
Arithmetic SD (s)		500	600	700	330	500
Arithmetic RSD (%)		8.1	8.7	8.9	6.3	7.2
Number of Sample Measurements (N)		5	5	5	5	5

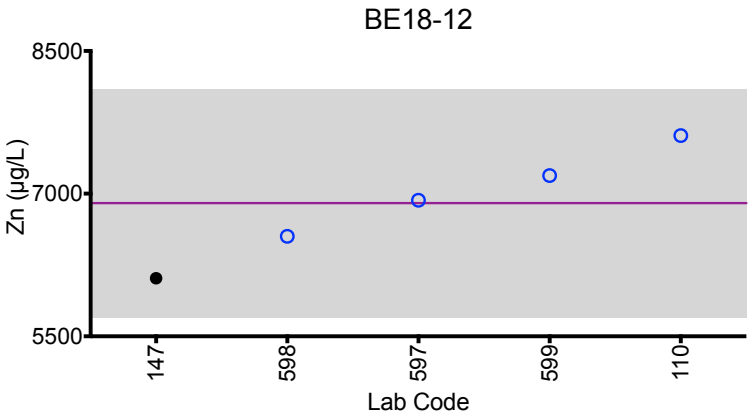
*Denotes a statistical Outlier.

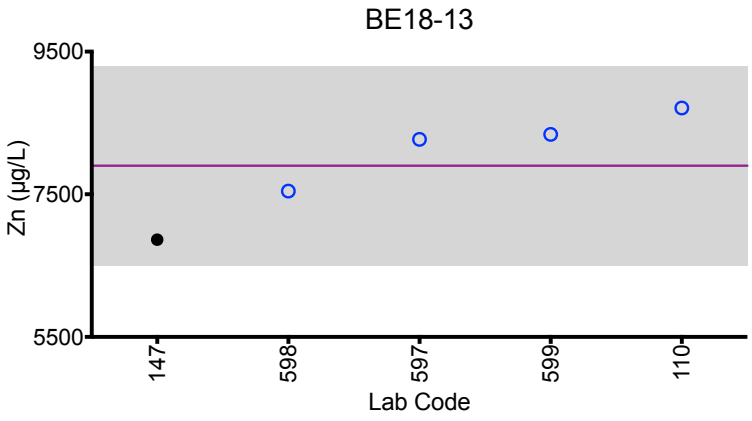
NEW YORK STATE | Department of Health | Wadsworth Center

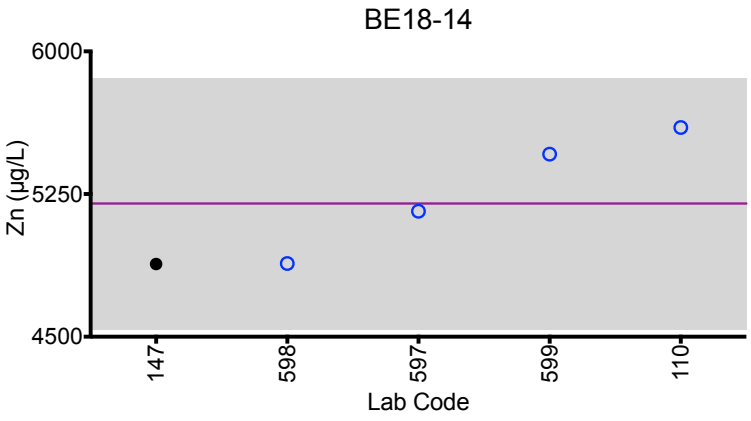
Results for Event #3, 2018: Summary Figures

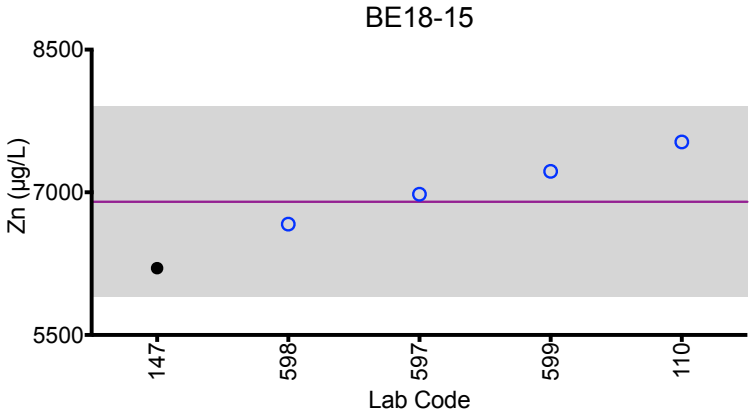
Whole Blood Zn











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Whole Blood Be (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
110	ICP-MS	2.26	0.90	1.29	3.98	3.16
147	ICP-MS	2.37	<1.53	<1.53	4.12	2.88
598	ICP-MS	2.40742	0.919209	1.218112	4.602252	3.068056
Summary Statistics						
		BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Arithmetic Mean ($\bar{x}$)		2.35	0.910	1.25	4.2	3.04
Arithmetic SD (s)		0.08	0.014	0.05	0.3	0.14
Arithmetic RSD (%)		3.4	1.5	4.0	7.1	4.6
Number of Sample Measurements (N)		3	2	2	3	3

*Denotes a statistical Outlier.

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Whole Blood Cs (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
110	ICP-MS	1.62	1.57	1.55	1.45	1.45
597	DRC/CC-ICP-MS	1.46	1.44	1.60	1.42	1.34
598	ICP-MS	1.575763	1.480115	1.645485	1.447385	1.522446
599	DRC/CC-ICP-MS	1.56	1.54	1.55	1.48	1.39
Summary Statistics						
		BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Arithmetic Mean ($\bar{x}$)		1.55	1.51	1.59	1.449	1.43
Arithmetic SD (s)		0.07	0.06	0.05	0.025	0.08
Arithmetic RSD (%)		4.5	4.0	3.1	1.7	5.6
Number of Sample Measurements (N)		4	4	4	4	4

*Denotes a statistical Outlier.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Laboratory Data and Summary Statistics

Whole Blood Pt (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
110	ICP-MS	0.31	5.61	1.77	0.66	7.45
598	ICP-MS	0.29	5.01	1.63	0.61	6.29
599	DRC/CC-ICP-MS	0.51	5.87	1.58	0.65	7.43
Summary Statistics						
		BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Arithmetic Mean ($\bar{x}$)		0.37	5.5	1.66	0.64	7.1
Arithmetic SD (s)		0.12	0.4	0.10	0.03	0.7
Arithmetic RSD (%)		32	7.3	6.0	4.7	9.9
Number of Sample Measurements (N)		3	3	3	3	3

*Denotes a statistical Outlier.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Whole Blood Sn (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
110	ICP-MS	2.54	1.91	3.16	6.25	0.50
147	ICP-MS	2.53	1.73	2.96	6.29	0.551
597	DRC/CC-ICP-MS	2.47	1.86	3.29	5.98	0.621
598	ICP-MS	2.65	1.78	3.51	6.38	0.58
Summary Statistics						
		BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Arithmetic Mean ($\bar{x}$)		2.55	1.82	3.23	6.22	0.56
Arithmetic SD (s)		0.07	0.08	0.23	0.17	0.05
Arithmetic RSD (%)		2.7	4.4	7.1	2.7	8.9
Number of Sample Measurements (N)		4	4	4	4	4

*Denotes a statistical Outlier.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Whole Blood W (µg/L)						
Lab Code	**Method**	**BE18-11**	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
110	ICP-MS	0.19	0.23	0.08	0.13	0.31
200	ICP-MS	0.22	0.2	0.08	0.13	0.32
598	ICP-MS	0.26	0.25	0.11	0.15	0.35
599	DRC/CC-ICP-MS	*1.96	*0.73	*0.32	*0.6	*0.73
Summary Statistics						
		BE18-11	**BE18-12**	**BE18-13**	**BE18-14**	**BE18-15**
Arithmetic Mean ($\bar{x}$)		0.22	0.227	0.090	0.137	0.327
Arithmetic SD (s)		0.04	0.025	0.017	0.012	0.021
Arithmetic RSD (%)		18	11	19	8.8	6.4
Number of Sample Measurements (N)		3	3	3	3	3

*Denotes a statistical Outlier.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Additional Elements in Whole Blood

Whole Blood Ag (µg/L)

Lab Code	Method	BE18-11	BE18-12	BE18-13	BE18-14	BE18-15
147	ICP-MS	< 0.173	< 0.173	< 0.173	< 0.173	< 0.173

Whole Blood Al (µg/L)

Lab Code	Method	BE18-11	BE18-12	BE18-13	BE18-14	BE18-15
147	ICP-MS	<5.4	<5.4	9.07	6.58	5.69

Whole Blood Bi (µg/L)

Lab Code	Method	BE18-11	BE18-12	BE18-13	BE18-14	BE18-15
147	ICP-MS	< 0.0251	< 0.0251	< 0.0251	< 0.0251	< 0.0251

Whole Blood I (µg/L)

Lab Code	Method	BE18-11	BE18-12	BE18-13	BE18-14	BE18-15
147	ICP-MS	22.0	21.0	21.0	27.3	25.7

Whole Blood Li (µg/L)

Lab Code	Method	BE18-11	BE18-12	BE18-13	BE18-14	BE18-15
147	ICP-MS	0.363	0.432	0.450	0.677	0.648

Whole Blood Mg (µg/L)

Lab Code	Method	BE18-11	BE18-12	BE18-13	BE18-14	BE18-15
597	DRC/CC-ICP-MS	24400	24000	26000	28100	28500

Whole Blood Sr (µg/L)

Lab Code	Method	BE18-11	BE18-12	BE18-13	BE18-14	BE18-15
103	DRC/CC-ICP-MS	26.4	25.3	25.9	28.0	28.0

Whole Blood Te (µg/L)

Lab Code	Method	BE18-11	BE18-12	BE18-13	BE18-14	BE18-15
147	ICP-MS	< 0.0791	< 0.0791	< 0.0791	< 0.0791	< 0.0791

Whole Blood Th (µg/L)

Lab Code	Method	BE18-11	BE18-12	BE18-13	BE18-14	BE18-15
147	ICP-MS	< 0.0169	< 0.0169	< 0.0169	< 0.0169	< 0.0169

Whole Blood Ti (µg/L)

Lab Code	Method	BE18-11	BE18-12	BE18-13	BE18-14	BE18-15
200	ICP-MS	10.0	5.4	11.6	3.8	2.7

NEW YORK STATE | Department of Health | Wadsworth Center

Event #3, 2018

Trace Elements in Urine

Wadsworth Center
NEW YORK STATE DEPARTMENT OF HEALTH
Trace Elements Laboratory

Event #3, 2018:
Trace Elements in Urine

PT Materials

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

Graded Elements

Eleven elements in urine are formally graded: As, Ba, Be, Cd, Co, Cr, Hg, Mn, Pb, Tl, and U. Target values for the graded elements are assigned to these pools based on (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 22 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, 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

	Urine As (µg/L)				
	UE18-11	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
Target (Robust Mean (x*))	20.5	173	86.0	29.6	7.57
Upper Limit	26.5	208	103.2	35.6	13.57
Lower Limit	14.5	138	68.8	23.6	1.57
Robust SD (s*)	1.5	10	5.4	2.1	0.52
Robust RSD (%)	7.3	5.8	6.3	7.1	6.9
Number of Sample Measurements (N)	21	20	21	21	20
Standard Uncertainty (*u*)	0.4	3	1.0	0.6	0.10

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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Performance of Participating Laboratories

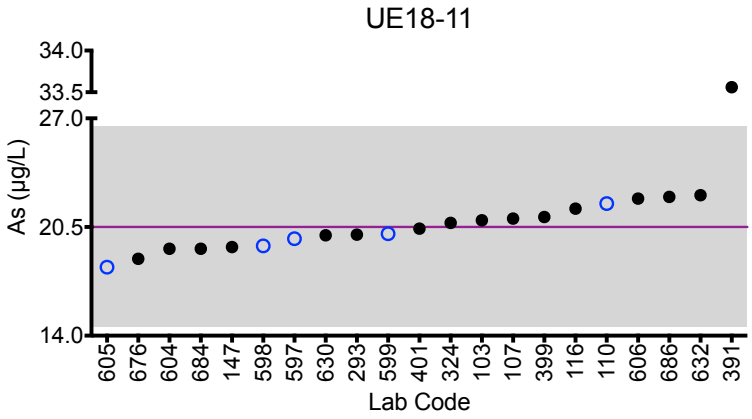
		Urine As (µg/L)				
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
	Target	**20.5**	**173**	**86.0**	**29.6**	**7.57**
103	DRC/CC-ICP-MS	20.9	175	86.3	29.7	7.58
107	DRC/CC-ICP-MS	21	170	86	28	6.9
110	DRC/CC-ICP-MS	21.9	183	89.8	30.6	7.80
116	ICP-MS/MS	21.6	190	96.3	33.5	8.12
147	ICP-MS	19.3	162	81.6	27.8	7.09
293	DRC/CC-ICP-MS	20.04	176.97	85.92	29.25	7.25
324	ICP-MS	20.746	173.338	86.207	29.041	7.403
391	ICP-MS	33.56 ↑	*10.49 ↓	180.275↑	53.45 ↑	*76.023↑
399	DRC/CC-ICP-MS	21.1	179	88.9	29.7	7.58
401	DRC/CC-ICP-MS	20.4	174	87.8	29.2	7.71
597	DRC/CC-ICP-MS	19.8	170	83.6	28.9	7.46
598	DRC/CC-ICP-MS	19.37	165.25	84.66	28.52	7.11
599	DRC/CC-ICP-MS	20.1	175.2	85.7	30.6	7.78
604	DRC/CC-ICP-MS	19.2	160	78.5	27.2	7.15
605	ICP-MS	18.1	152	74.9	25.7	6.29
606	DRC/CC-ICP-MS	22.2	187	92.1	32.0	8.18
630	DRC/CC-ICP-MS	20	168	81.7	27.3	7.4
632	DRC/CC-ICP-MS	22.4	182	90.2	30.9	8.88
676	DRC/CC-ICP-MS	18.6	158	79.0	28.0	7.34
684	DRC/CC-ICP-MS	19.2	167	82.7	32.6	8.45
686	DRC/CC-ICP-MS	22.3	180	89.7	32.0	9.72

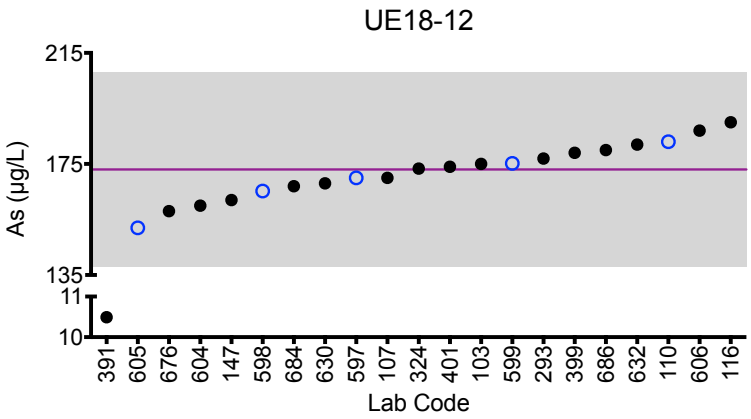
Based on the grading criteria for As in Urine, 95% of results were satisfactory, with 1 of the 21 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

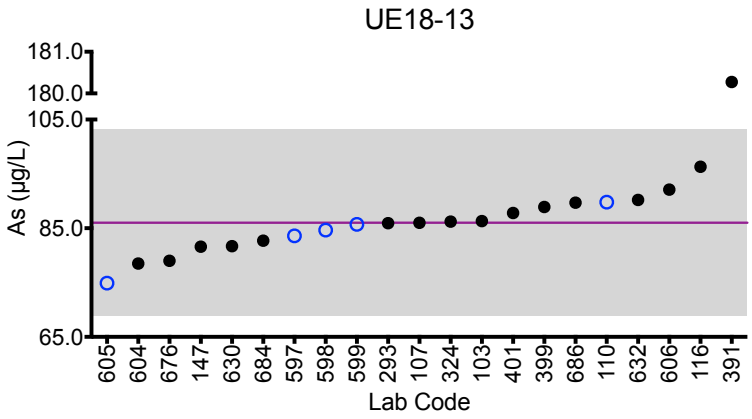
NEW YORK STATE | Department of Health | Wadsworth Center

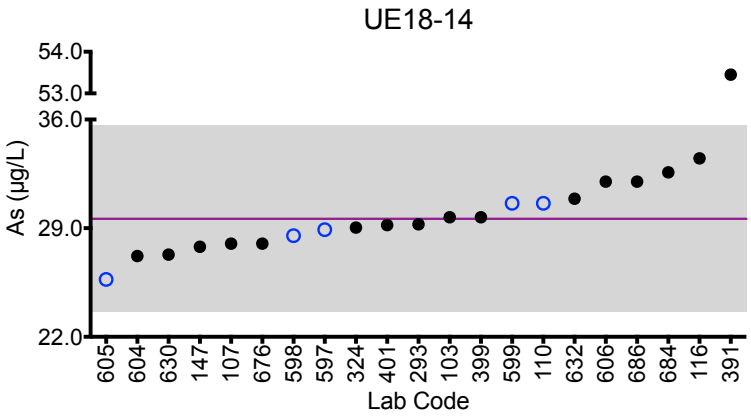
Results for Event #3, 2018: Summary Figures

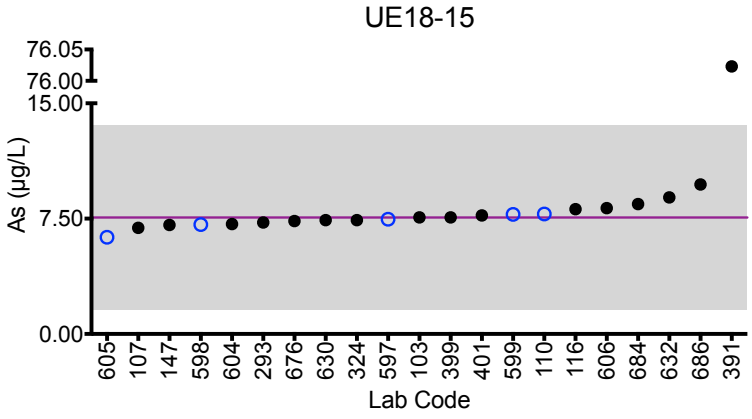
Urine As











Legend:

o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

	Urine Ba (µg/L)				
	UE18-11	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
Target (Robust Mean (x*))	7.9	13.2	5.68	8.22	1.19
Upper Limit	9.5	15.8	6.82	9.86	2.19
Lower Limit	6.3	10.6	4.54	6.58	0.19
Robust SD (s*)	0.5	0.6	0.32	0.45	0.05
Robust RSD (%)	6.3	4.5	5.6	5.5	4.2
Number of Sample Measurements (N)	14	14	14	14	14
Standard Uncertainty (*u*)	0.2	0.2	0.10	0.10	0.02

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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Performance of Participating Laboratories

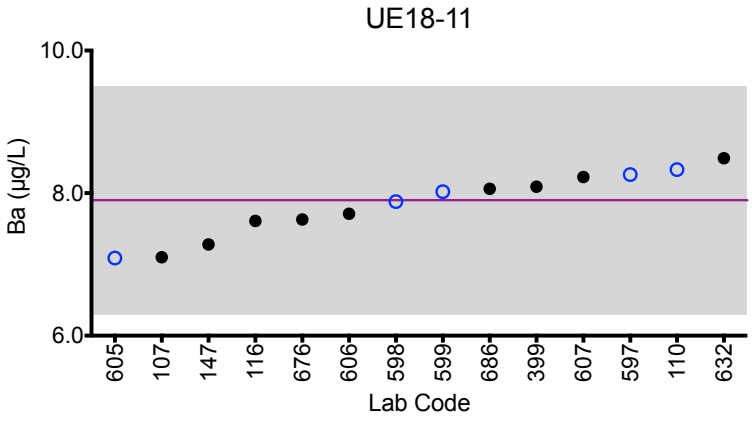
		Urine Ba (µg/L)				
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
	Target	**7.9**	**13.2**	**5.68**	**8.22**	**1.19**
107	ICP-MS	7.1	14	5.4	8.8	1.2
110	ICP-MS	8.33	13.6	5.99	8.73	1.27
116	ICP-MS/MS	7.61	12.6	5.5	7.8	1.1
147	ICP-MS	7.28	12.3	5.26	8.07	1.17
399	ICP-MS	8.09	13.4	5.82	8.19	1.19
597	DRC/CC-ICP-MS	8.26	13.6	5.99	8.52	1.39
598	ICP-MS	7.88	13.40	5.75	8.3	1.18
599	DRC/CC-ICP-MS	8.02	13.49	5.68	7.93	1.36
605	ICP-MS	7.09	11.5	5.14	7.09	0.949
606	DRC/CC-ICP-MS	7.71	12.7	5.52	8.42	1.18
607	ICP-MS	8.225	13.634	5.934	8.214	1.195
632	ICP-MS	8.49	14.0	6.12	8.79	1.22
676	ICP-MS	7.63	12.6	5.51	7.75	1.13
686	ICP-MS	8.06	13.3	5.79	8.08	1.16

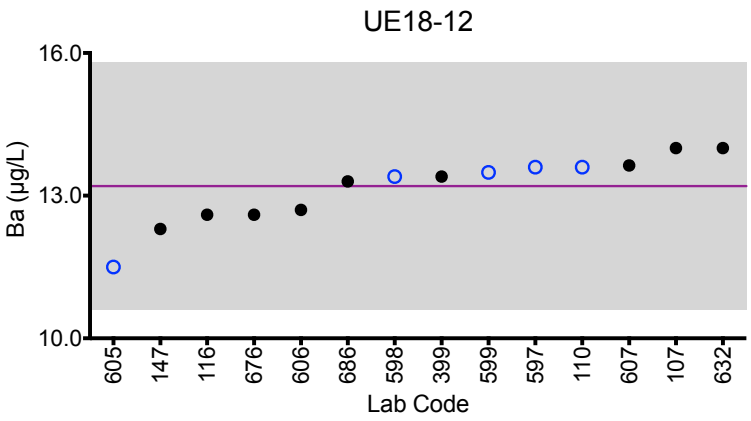
Based on the grading criteria for Ba in Urine, 100% of results were satisfactory, with 0 of the 14 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

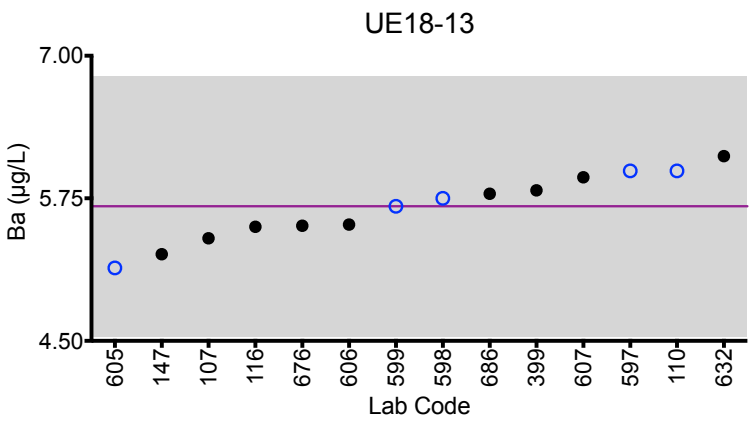
NEW YORK STATE | Department of Health | Wadsworth Center

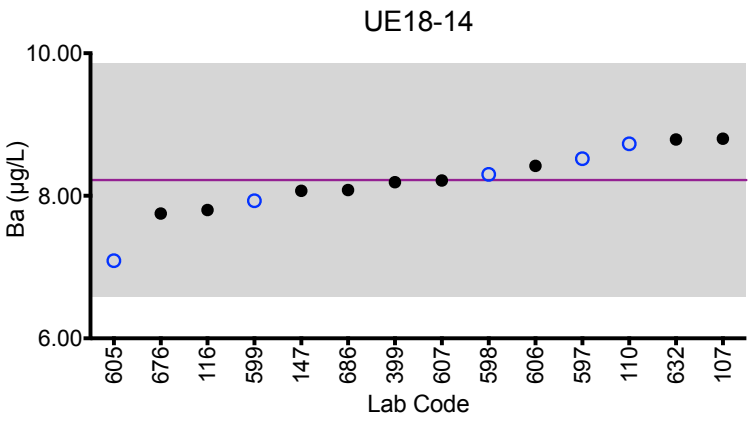
Results for Event #3, 2018: Summary Figures

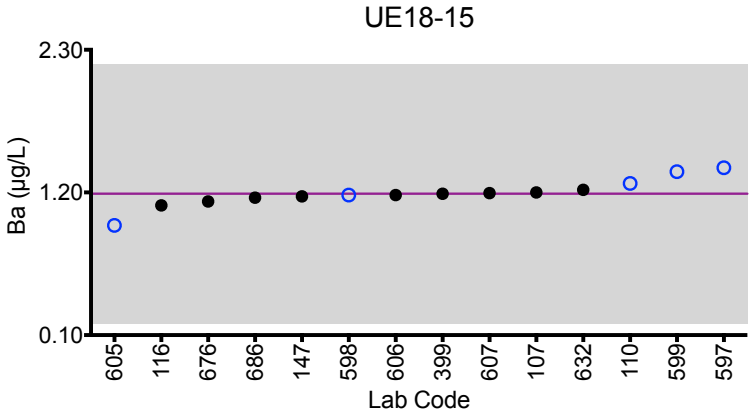
Urine Ba











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

	Urine Be (µg/L)				
	UE18-11	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
Target (Robust Mean (x*))	0.422	1.42	3.35	3.74	1.63
Upper Limit	1.422	2.42	4.35	4.74	2.63
Lower Limit	0.000	0.42	2.35	2.74	0.63
Robust SD (s*)	0.036	0.11	0.34	0.11	0.10
Robust RSD (%)	8.5	7.7	10	2.9	6.1
Number of Sample Measurements (N)	11	12	12	12	12
Standard Uncertainty (*u*)	0.010	0.04	0.10	0.04	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.

Results for Event #3, 2018:
Performance of Participating Laboratories

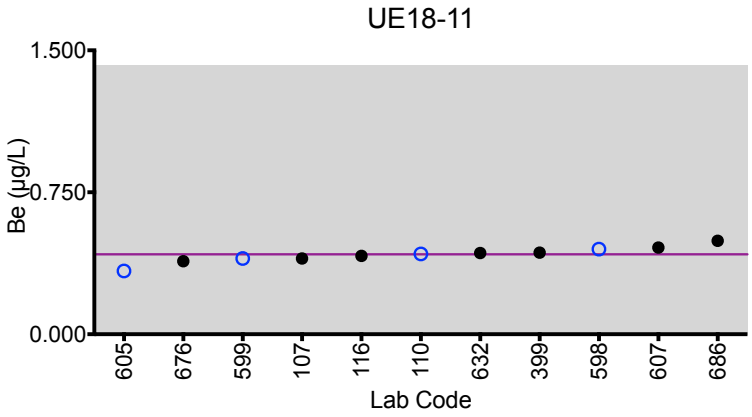
Urine Be (µg/L)						
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
	Target	**0.422**	**1.42**	**3.35**	**3.74**	**1.63**
107	ICP-MS	0.4	1.5	3.1	3.8	1.6
110	ICP-MS	0.424	1.46	3.56	3.63	1.59
116	ICP-MS/MS	0.414	1.3	2.9	3.27	1.48
147	ICP-MS	< 0.405	1.51	3.59	4.24	1.70
399	ICP-MS	0.431	1.42	3.42	3.76	1.67
598	ICP-MS	0.45	1.53	3.65	4.05	1.74
599	DRC/CC-ICP-MS	0.40	1.27	3.08	3.69	1.64
605	ICP-MS	0.334	1.23	2.93	3.16	1.41
607	ICP-MS	0.458	1.499	3.526	3.75	1.61
632	ICP-MS	0.429	1.38	3.32	3.69	1.68
676	ICP-MS	0.386	1.37	3.31	3.77	1.56
686	ICP-MS	0.494	1.54	3.83	3.79	1.86

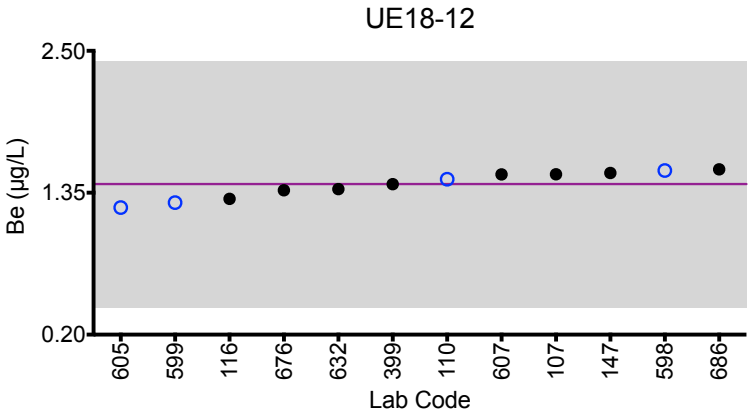
Based on the grading criteria for Be in Urine, 100% of results were satisfactory, with 0 of the 12 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

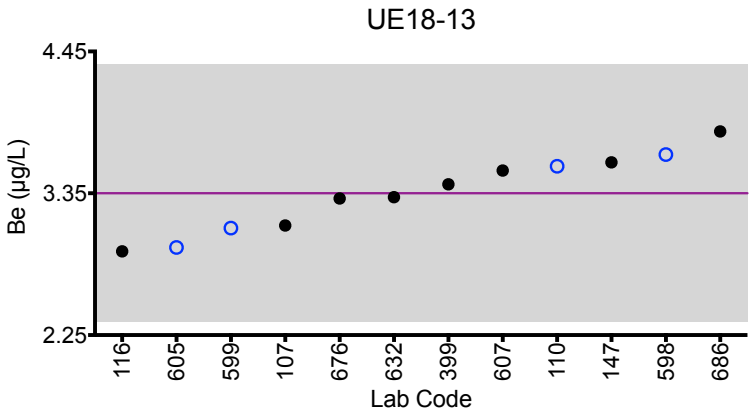
NEW YORK STATE | Department of Health | Wadsworth Center

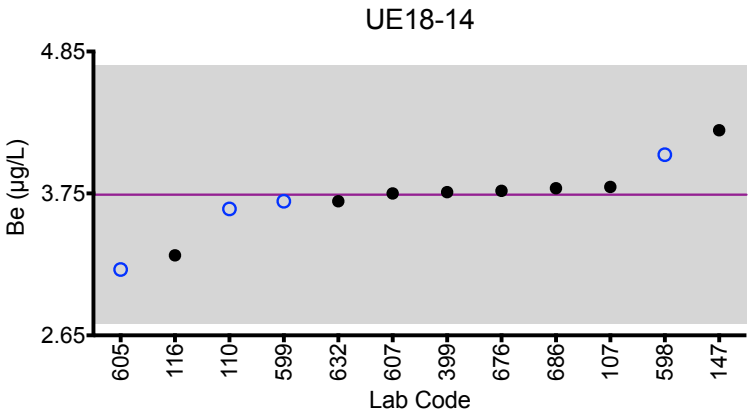
Results for Event #3, 2018: Summary Figures

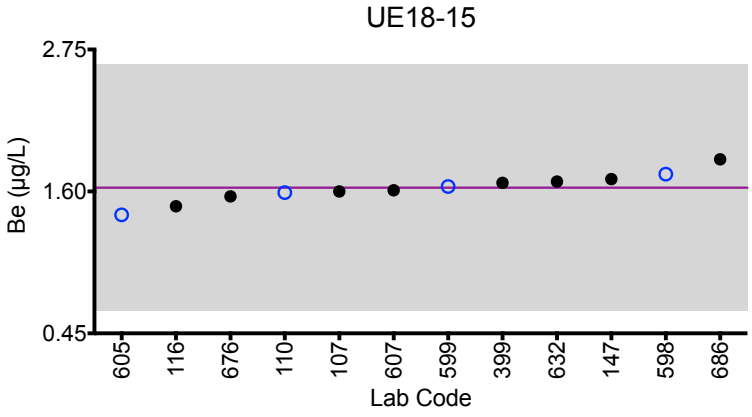
Urine Be











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

	Urine Cd (µg/L)				
	UE18-11	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
Target (Robust Mean (x*))	1.08	2.23	3.49	0.512	4.42
Upper Limit	2.08	3.23	4.49	1.512	5.42
Lower Limit	0.08	1.23	2.49	0.000	3.42
Robust SD (s*)	0.10	0.19	0.25	0.041	0.29
Robust RSD (%)	9.3	8.5	7.2	8.0	6.6
Number of Sample Measurements (N)	21	21	20	19	21
Standard Uncertainty (*u*)	0.03	0.05	0.07	0.010	0.08

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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Performance of Participating Laboratories

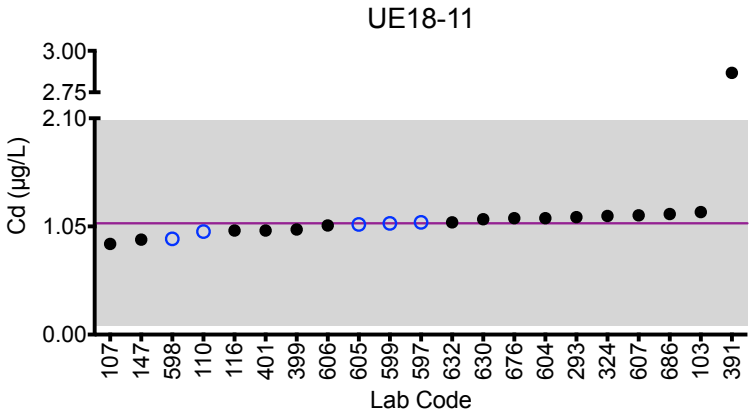
		Urine Cd (µg/L)				
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
	Target	**1.08**	**2.23**	**3.49**	**0.512**	**4.42**
103	DRC/CC-ICP-MS	1.19	2.42	3.88	0.562	4.89
107	DRC/CC-ICP-MS	0.88	2.2	3.2	0.49	4.4
110	ICP-MS	1.00	2.03	3.59	0.491	4.39
116	ICP-MS/MS	1.01	2.12	3.23	0.448	4.15
147	ICP-MS	0.922	2.02	3.12	0.469	3.95
293	DRC/CC-ICP-MS	1.14	2.22	3.64	0.52	4.6
324	ICP-MS	1.151	2.354	3.510	<1	4.452
391	ICP-MS	2.867 ↑	0.953 ↓	*0.466 ↓	*5.374 ↑	3.739
399	DRC/CC-ICP-MS	1.02	2.19	3.50	0.525	4.44
401	DRC/CC-ICP-MS	1.01	2.14	3.48	0.45	4.27
597	DRC/CC-ICP-MS	1.09	2.26	3.46	0.55	4.54
598	DRC/CC-ICP-MS	0.93	1.99	3.26	0.47	4.00
599	DRC/CC-ICP-MS	1.08	2.22	3.46	0.53	4.52
604	DRC/CC-ICP-MS	1.13	2.41	3.84	0.534	4.64
605	ICP-MS	1.07	2.49	4.13	0.529	4.63
606	DRC/CC-ICP-MS	1.06	2.17	3.46	0.481	4.32
607	ICP-MS	1.158	2.421	3.328	0.556	4.504
630	ICP-MS	1.12	2.35	3.48	0.495	4.26
632	DRC/CC-ICP-MS	1.09	2.33	3.66	0.539	4.90
676	DRC/CC-ICP-MS	1.13	2.09	3.20	0.505	4.10
686	ICP-MS	1.17	2.50	3.66	0.570	4.78

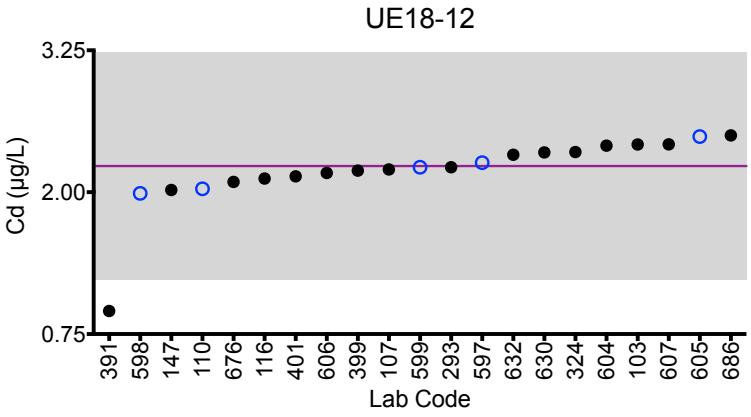
Based on the grading criteria for Cd in Urine, 96% of results were satisfactory, with 1 of the 21 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

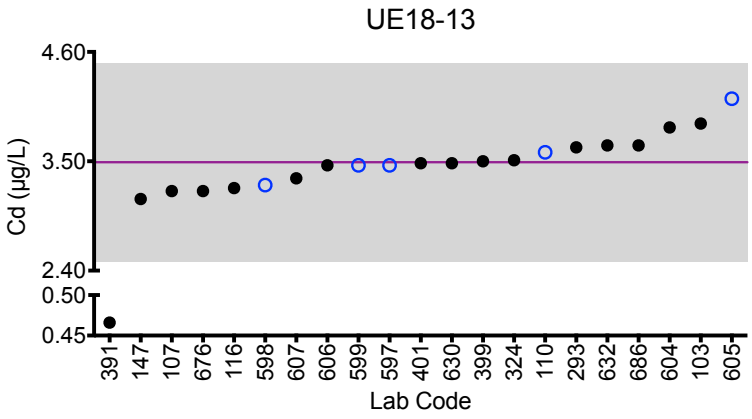
NEW YORK STATE | Department of Health | Wadsworth Center

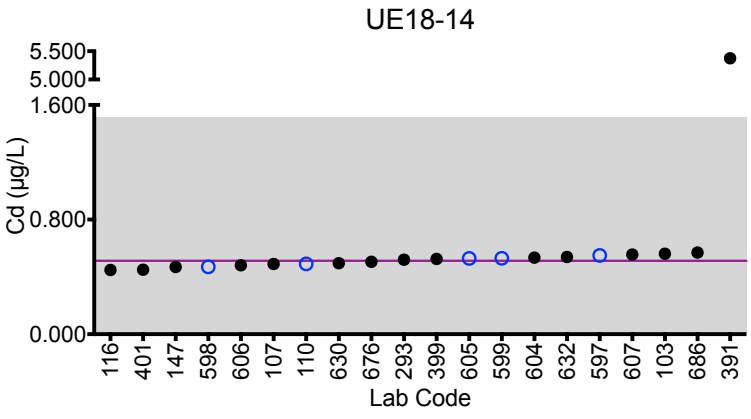
Results for Event #3, 2018: Summary Figures

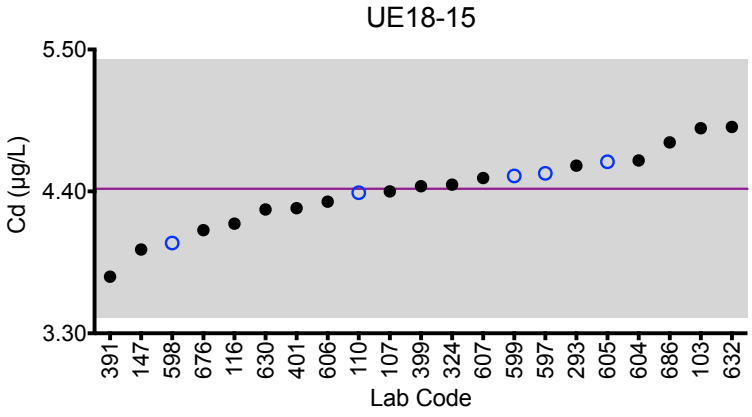
Urine Cd











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

	Urine Co (µg/L)				
	UE18-11	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
Target (Robust Mean (x*))	2.86	1.73	2.29	4.80	0.60
Upper Limit	4.36	3.23	3.79	6.30	2.10
Lower Limit	1.36	0.23	0.79	3.30	0.00
Robust SD (s*)	0.08	0.05	0.05	0.17	0.07
Robust RSD (%)	2.8	2.9	2.2	3.5	12
Number of Sample Measurements (N)	15	15	15	15	14
Standard Uncertainty (*u*)	0.03	0.02	0.02	0.05	0.02

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

NEW YORK STATE | Department of Health | Wadsworth Center

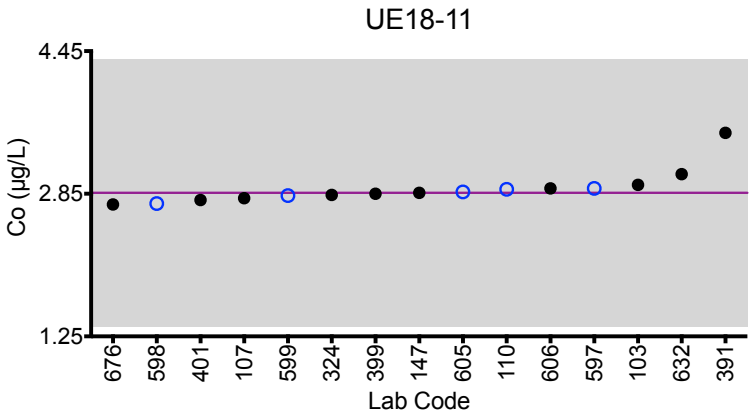
Results for Event #3, 2018:
Performance of Participating Laboratories

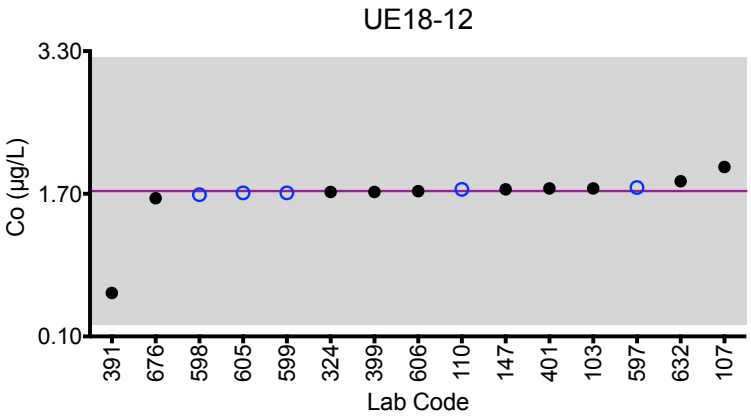
		Urine Co (µg/L)				
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
	Target	**2.86**	**1.73**	**2.29**	**4.80**	**0.60**
103	DRC/CC-ICP-MS	2.95	1.76	2.36	4.96	0.605
107	ICP-MS	2.8	2	2.2	5	0.69
110	ICP-MS	2.90	1.75	2.29	4.94	0.652
147	ICP-MS	2.86	1.75	2.32	4.80	0.534
324	ICP-MS	2.837	1.720	2.264	4.784	<1
391	ICP-MS	3.533	0.587	2.551	2.118 ↓	0.191
399	DRC/CC-ICP-MS	2.85	1.72	2.32	4.83	0.556
401	DRC/CC-ICP-MS	2.78	1.76	2.28	4.66	0.55
597	DRC/CC-ICP-MS	2.91	1.77	2.31	4.50	0.59
598	ICP-MS	2.74	1.69	2.23	4.73	0.60
599	DRC/CC-ICP-MS	2.83	1.71	2.32	4.91	0.55
605	ICP-MS	2.87	1.71	2.27	4.85	0.648
606	DRC/CC-ICP-MS	2.91	1.73	2.28	4.73	0.548
632	ICP-MS	3.07	1.84	2.44	5.16	0.757
676	ICP-MS	2.73	1.65	2.22	4.72	0.654

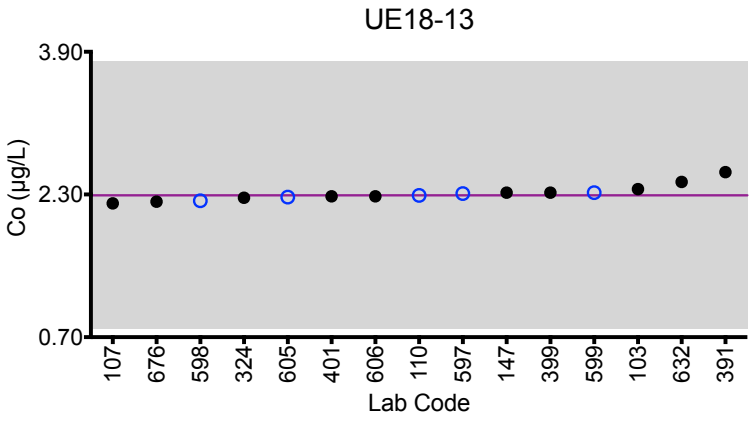
Based on the grading criteria for Co in Urine, 99% of results were satisfactory, with 0 of the 15 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

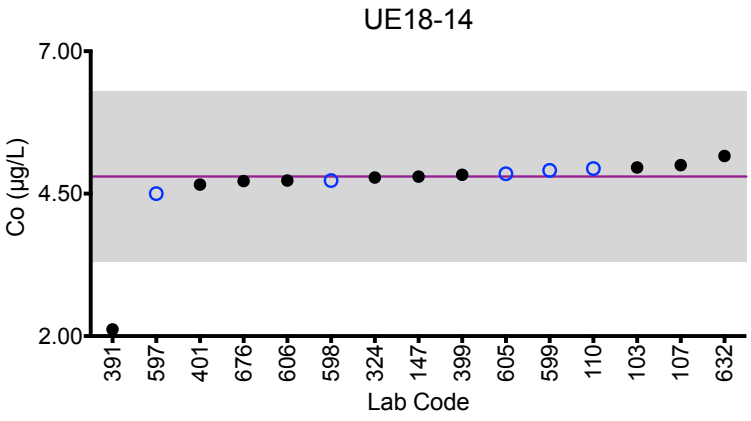
Results for Event #3, 2018: Summary Figures

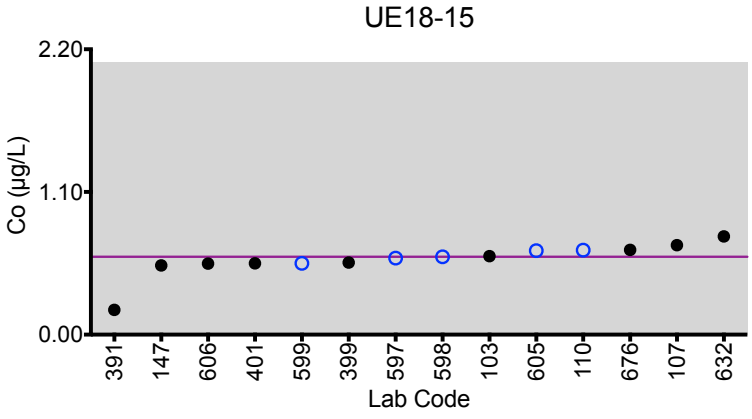
Urine Co











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

	Urine Cr (µg/L)				
	UE18-11	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
Target (Robust Mean (x*))	14.3	3.07	1.22	5.19	3.43
Upper Limit	17.3	6.07	4.22	8.19	6.43
Lower Limit	11.3	0.07	0.00	2.19	0.43
Robust SD (s*)	0.5	0.26	0.21	0.24	0.30
Robust RSD (%)	3.5	8.5	17	4.6	8.7
Number of Sample Measurements (N)	10	10	11	11	11
Standard Uncertainty (*u*)	0.2	0.10	0.08	0.09	0.10

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

NEW YORK STATE | Department of Health | Wadsworth Center

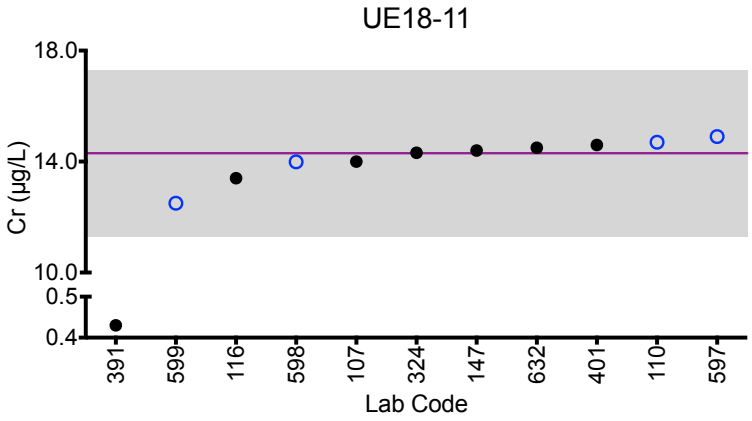
Results for Event #3, 2018:
Performance of Participating Laboratories

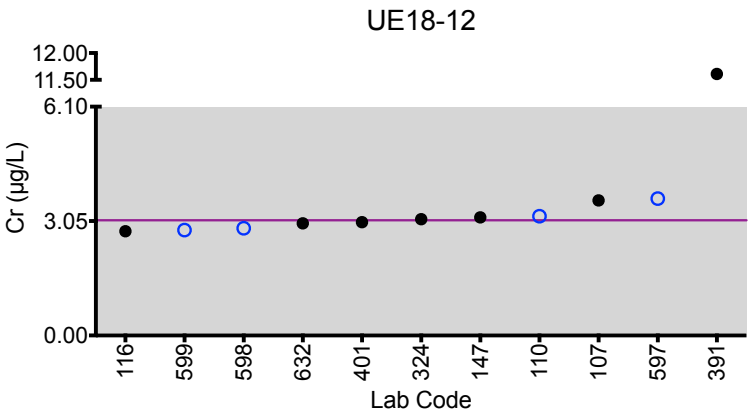
		Urine Cr (µg/L)				
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
	Target	**14.3**	**3.07**	**1.22**	**5.19**	**3.43**
107	DRC/CC-ICP-MS	14	3.6	1.1	4.9	2.9
110	DRC/CC-ICP-MS	14.7	3.18	1.30	5.46	3.47
116	ICP-MS/MS	13.4	2.78	1.11	4.77	3.08
147	DRC/CC-ICP-MS	14.4	3.15	1.03	4.91	3.33
324	ICP-MS	14.318	3.100	1.320	5.386	3.594
391	ICP-MS	*0.43 ↓	*11.61 ↑	1.587	2.666	6.28
401	DRC/CC-ICP-MS	14.6	3.02	1.23	5.25	3.28
597	DRC/CC-ICP-MS	14.9	3.65	1.98	5.39	3.88
598	DRC/CC-ICP-MS	13.99	2.86	0.98	5.30	3.23
599	DRC/CC-ICP-MS	12.5	2.81	1.23	5.17	3.55
632	DRC/CC-ICP-MS	14.5	2.99	1.03	5.33	3.45

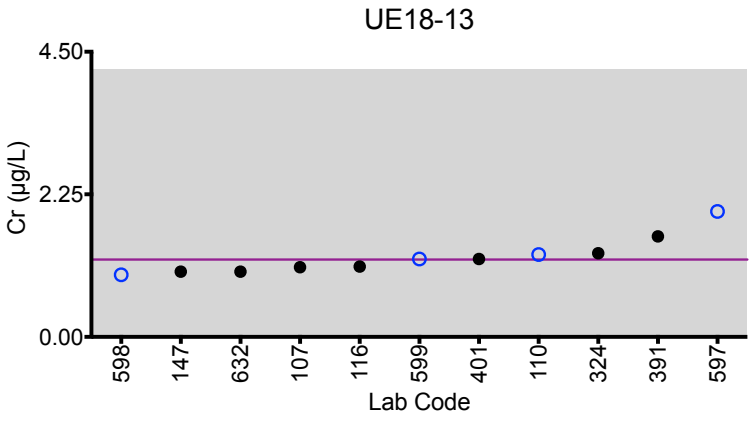
Based on the grading criteria for Cr in Urine, 96% of results were satisfactory, with 1 of the 11 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

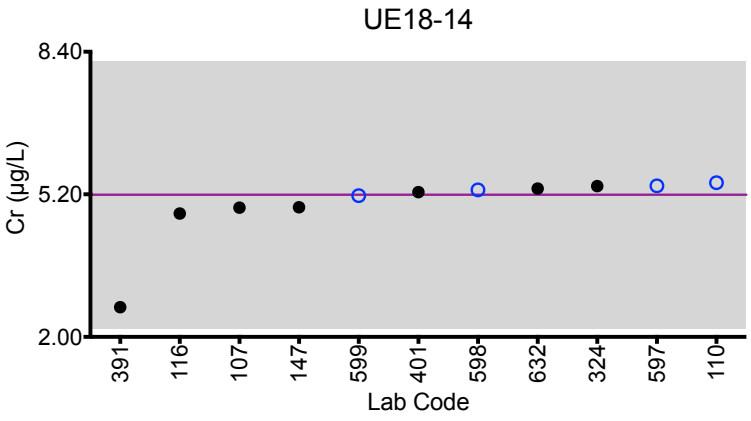
Results for Event #3, 2018: Summary Figures

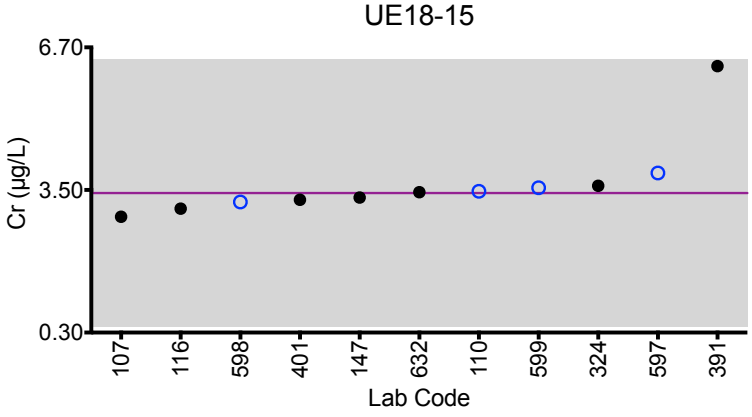
Urine Cr











Legend:

o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

	Urine Hg (µg/L)				
	UE18-11	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
Target (Robust Mean (x*))	9.9	34.3	3.4	39.3	4.8
Upper Limit	12.9	44.6	6.4	51.1	7.8
Lower Limit	6.9	24.0	0.4	27.5	1.8
Robust SD (s*)	1.2	3.0	0.5	2.1	0.6
Robust RSD (%)	12	8.7	15	5.3	13
Number of Sample Measurements (N)	17	17	17	16	17
Standard Uncertainty (*u*)	0.4	0.9	0.2	0.7	0.2

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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Performance of Participating Laboratories

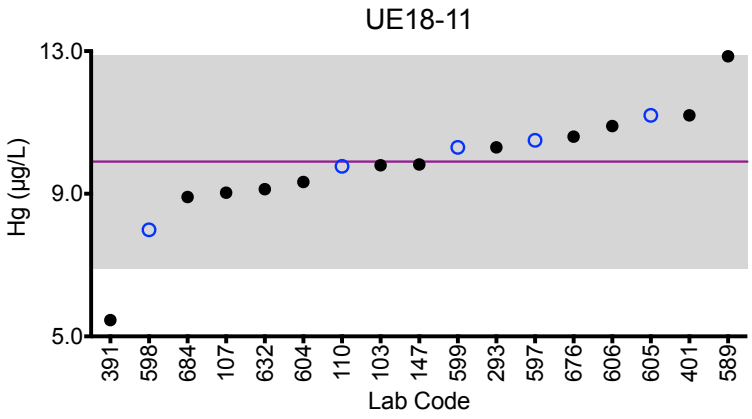
		Urine Hg (µg/L)				
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
	Target	**9.9**	**34.3**	**3.4**	**39.3**	**4.8**
103	DRC/CC-ICP-MS	9.80	34.6	3.03	38.9	4.43
107	DRC/CC-ICP-MS	9.03	30.99	2.68	40.5	4.77
110	ICP-MS	9.77	34.3	3.27	39.5	4.98
147	CV-AAS	9.82	34.1	3.06	40.5	4.81
293	DRC/CC-ICP-MS	10.3	35.99	3.43	39.68	4.81
391	ICP-MS	5.458 ↓	20.425 ↓	4.068	51.718 ↑	2.733
401	DRC/CC-ICP-MS	11.2	42.0	3.93	38.1	4.73
589	CV-AAS	12.855	34.248	7.512 ↑	38.530	6.907
597	DMA	10.5	34.2	3.81	39.5	5.30
598	ICP-MS	7.99	28.65	2.89	27.66	3.70
599	DRC/CC-ICP-MS	10.3	33.9	3.90	42.61	5.09
604	DRC/CC-ICP-MS	9.33	33.8	3.00	39.7	4.67
605	ICP-MS	11.2	39.7	3.54	>40.0	5.63
606	DRC/CC-ICP-MS	10.9	38.4	3.70	44.6	6.12
632	DRC/CC-ICP-MS	9.13	32.8	2.93	31.6	3.66
676	ICP-MS	10.6	38.0	3.46	37.2	4.49
684	DRC/CC-ICP-MS	8.91	31.7	2.85	34.1	4.11

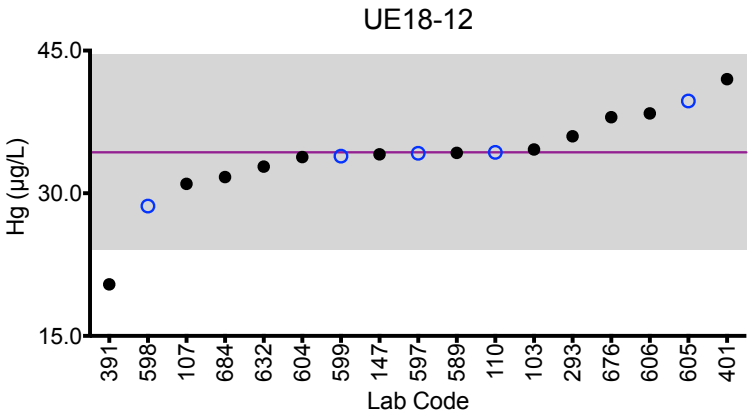
Based on the grading criteria for Hg in Urine, 95% of results were satisfactory, with 1 of the 17 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

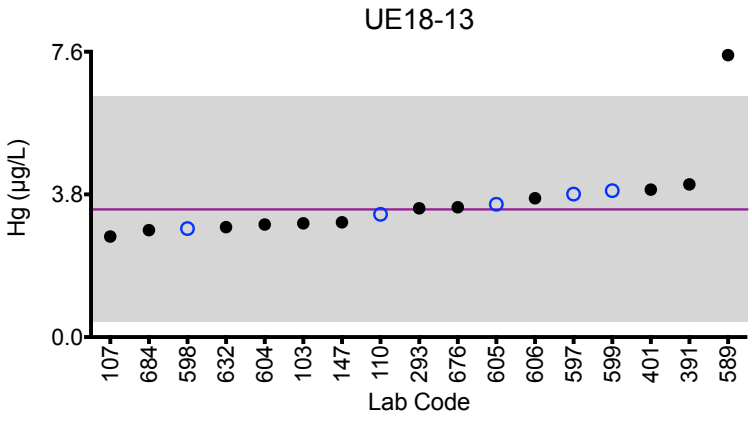
NEW YORK STATE | Department of Health | Wadsworth Center

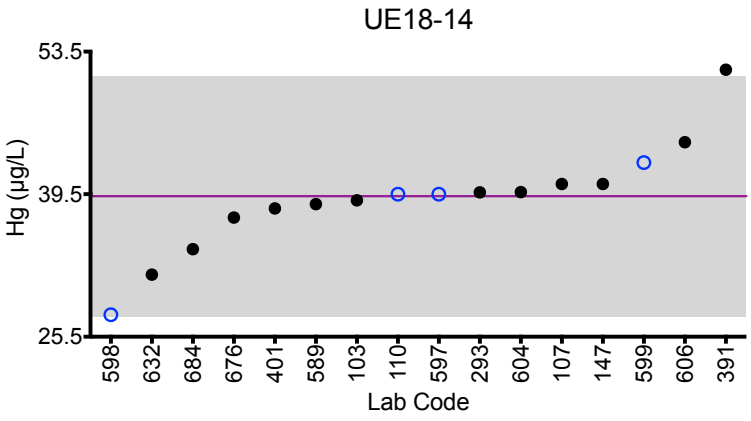
Results for Event #3, 2018: Summary Figures

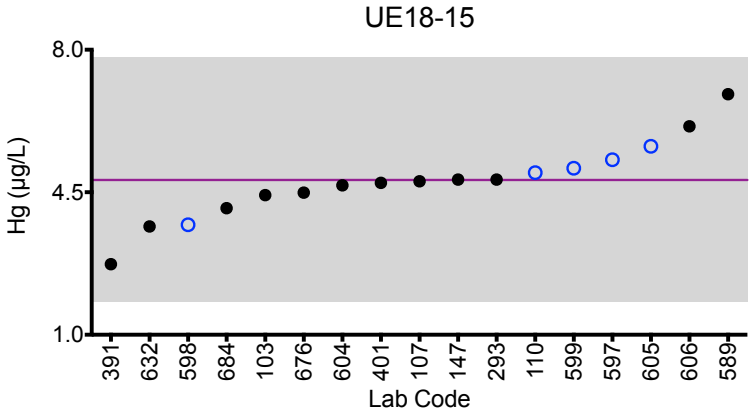
Urine Hg











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

	Urine Mn (µg/L)				
	UE18-11	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
Target (Robust Mean (x*))	1.66	5.16	2.77	0.92	3.24
Upper Limit	2.21	6.45	3.46	1.47	4.05
Lower Limit	1.11	3.87	2.08	0.37	2.43
Robust SD (s*)	0.17	0.33	0.25	0.22	0.32
Robust RSD (%)	10	6.4	9.0	24	9.9
Number of Sample Measurements (N)	18	18	18	17	18
Standard Uncertainty (*u*)	0.05	0.10	0.07	0.07	0.09

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

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Performance of Participating Laboratories

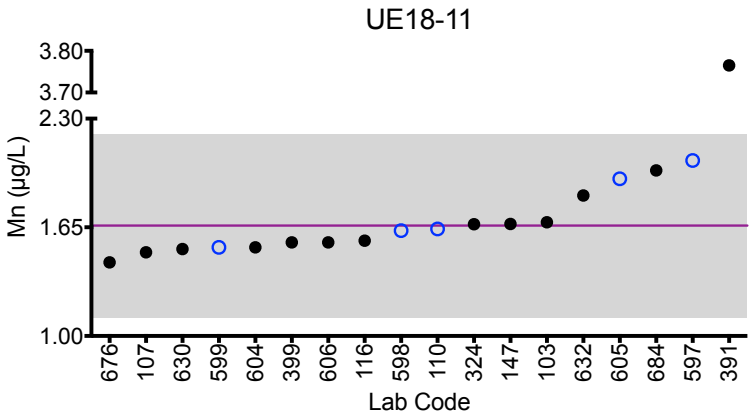
		Urine Mn (µg/L)				
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
	Target	**1.66**	**5.16**	**2.77**	**0.92**	**3.24**
103	DRC/CC-ICP-MS	1.68	5.33	2.74	0.803	3.19
107	DRC/CC-ICP-MS	1.5	5.2	2.3	0.99	3.1
110	DRC/CC-ICP-MS	1.64	5.15	2.67	0.802	3.21
116	ICP-MS/MS	1.57	5.1	2.74	0.507	3.45
147	DRC/CC-ICP-MS	1.67	5.26	2.66	0.767	3.19
324	ICP-MS	1.668	5.031	2.714	<1	3.468
391	ICP-MS	3.765 ↑	5.822	7.391 ↑	2.18 ↑	1.057 ↓
399	DRC/CC-ICP-MS	1.56	4.94	2.59	0.785	3.11
597	DRC/CC-ICP-MS	2.05	5.52	3.11	1.19	3.44
598	ICP-MS	1.63	5.00	2.68	1.13	3.42
599	DRC/CC-ICP-MS	1.53	4.63	2.54	1.21	3.49
604	DRC/CC-ICP-MS	1.53	4.87	2.58	0.847	2.99
605	ICP-MS	1.94	5.77	3.04	1.110	3.57
606	DRC/CC-ICP-MS	1.56	5.05	2.77	0.810	3.08
630	ICP-MS	1.52	4.88	2.51	0.739	2.74
632	DRC/CC-ICP-MS	1.84	5.50	2.98	0.915	3.60
676	DRC/CC-ICP-MS	1.44	4.74	2.92	0.673	2.89
684	ICP-MS	1.99	5.38	3.22	1.65 ↑	3.67

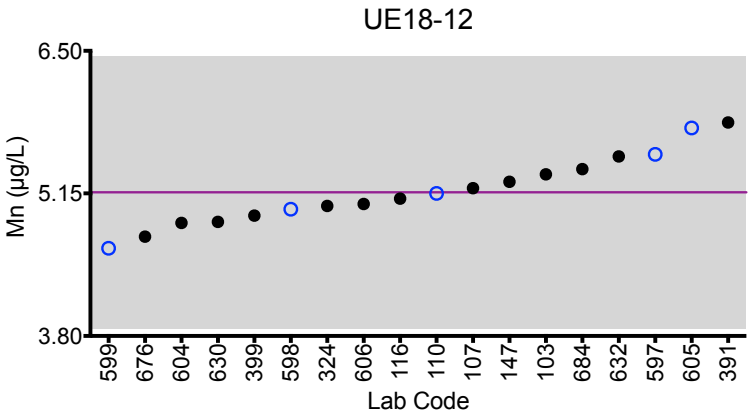
Based on the grading criteria for Mn in Urine, 94% of results were satisfactory, with 1 of the 18 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

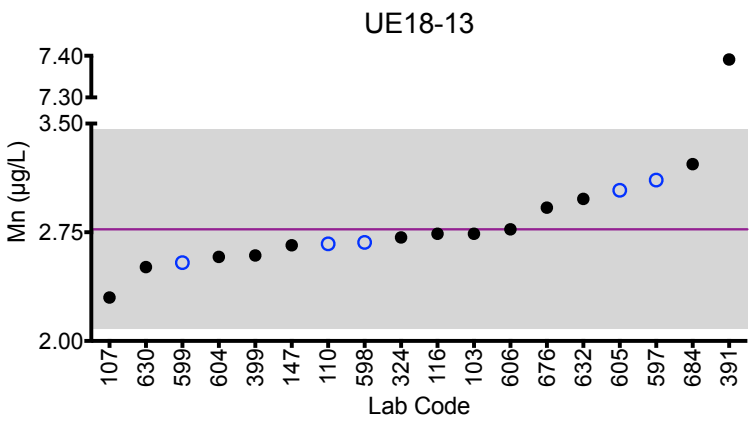
NEW YORK STATE | Department of Health | Wadsworth Center

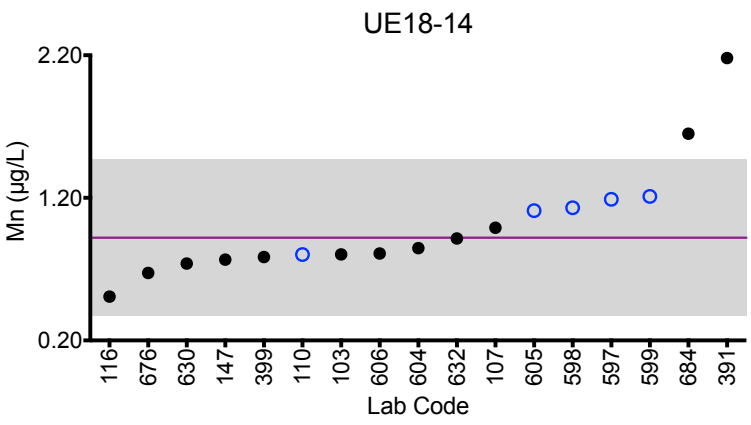
Results for Event #3, 2018: Summary Figures

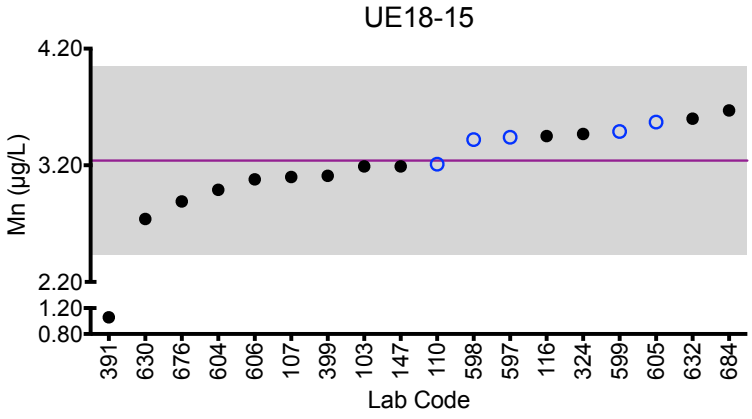
Urine Mn











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

	Urine Pb (µg/L)				
	UE18-11	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
Target (Robust Mean (x*))	13.9	5.71	3.14	5.69	3.20
Upper Limit	16.7	6.85	4.14	6.83	4.20
Lower Limit	11.1	4.57	2.14	4.55	2.20
Robust SD (s*)	0.7	0.21	0.18	0.27	0.16
Robust RSD (%)	5.0	3.7	5.7	4.7	5.0
Number of Sample Measurements (N)	18	18	18	18	17
Standard Uncertainty (*u*)	0.2	0.06	0.05	0.08	0.05

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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Performance of Participating Laboratories

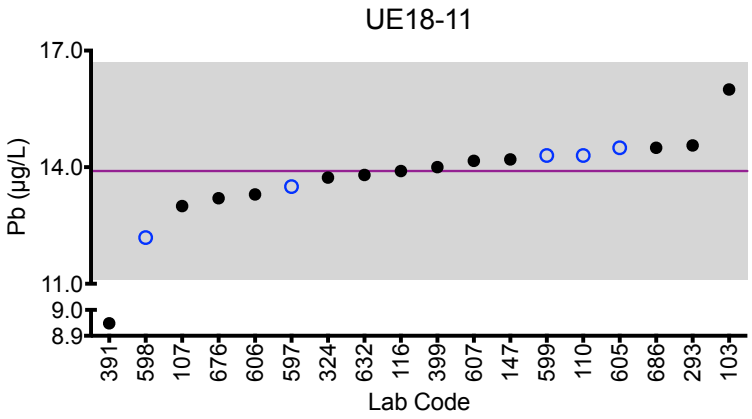
		Urine Pb (µg/L)				
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
	Target	**13.9**	**5.71**	**3.14**	**5.69**	**3.20**
103	DRC/CC-ICP-MS	16.0	6.45	3.55	6.35	3.61
107	ICP-MS	13	5.8	2.8	5.7	3.2
110	ICP-MS	14.3	5.84	3.24	5.72	3.24
116	ICP-MS/MS	13.9	5.61	3.14	5.69	3.18
147	ICP-MS	14.2	5.97	3.17	5.86	3.23
293	DRC/CC-ICP-MS	14.56	5.93	3.31	5.85	3.31
324	ICP-MS	13.731	5.678	3.157	5.40	3.123
391	ICP-MS	8.948 ↓	1.146 ↓	1.95 ↓	6.596	*11.193 ↑
399	ICP-MS	14.0	5.82	3.21	5.90	3.40
597	DRC/CC-ICP-MS	13.5	5.37	3.06	5.33	3.00
598	ICP-MS	12.19	5.16	2.81	4.78	2.69
599	DRC/CC-ICP-MS	14.3	5.67	4.20 ↑	5.66	3.24
605	ICP-MS	14.5	5.83	3.16	5.86	3.21
606	ICP-MS	13.3	5.42	2.99	5.33	3.02
607	ICP-MS	14.164	5.777	3.182	5.848	3.318
632	ICP-MS	13.8	5.68	3.10	5.58	3.14
676	ICP-MS	13.2	5.39	3.02	5.36	2.99
686	ICP-MS	14.5	5.84	3.29	5.87	3.34

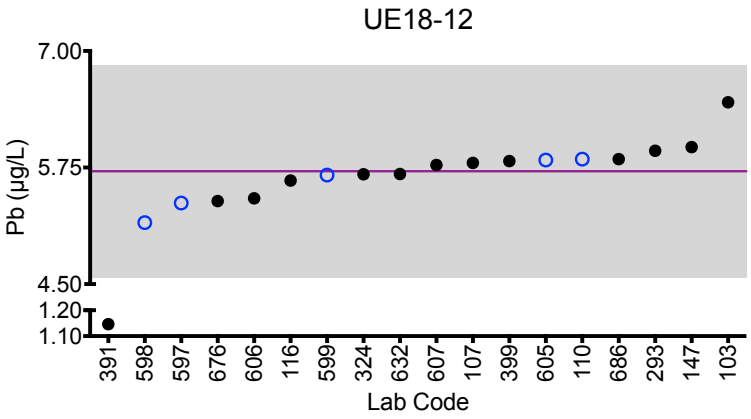
Based on the grading criteria for Pb in Urine, 94% of results were satisfactory, with 1 of the 18 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

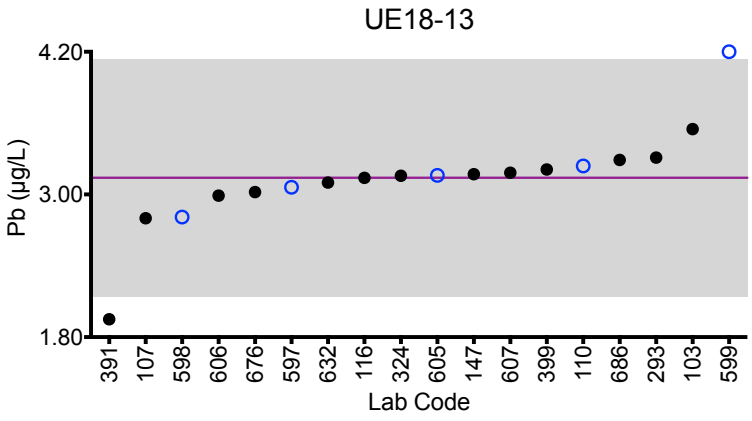
NEW YORK STATE | Department of Health | Wadsworth Center

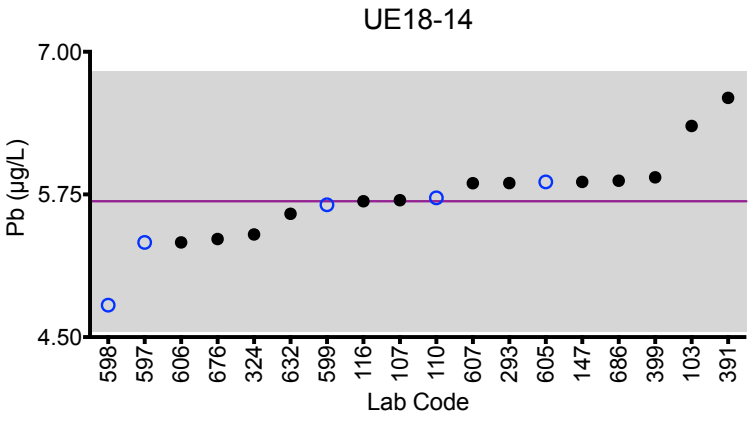
Results for Event #3, 2018: Summary Figures

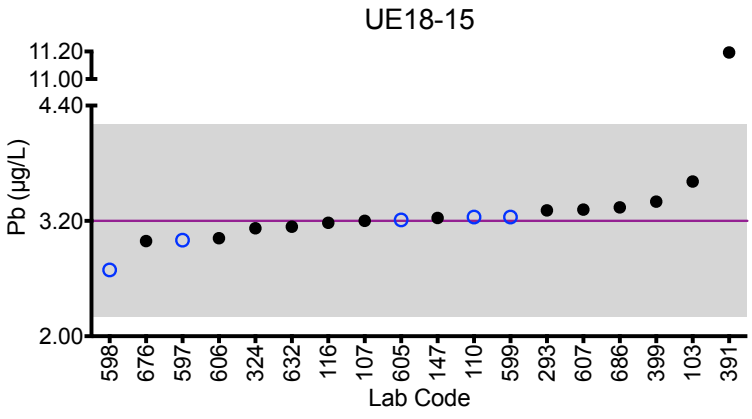
Urine Pb











Legend:

o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

	Urine Tl (µg/L)				
	UE18-11	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
Target (Robust Mean (x*))	0.670	1.14	4.55	0.401	0.275
Upper Limit	0.870	1.37	5.46	0.601	0.475
Lower Limit	0.470	0.91	3.64	0.201	0.075
Robust SD (s*)	0.045	0.07	0.29	0.019	0.015
Robust RSD (%)	6.7	6.1	6.4	4.7	5.5
Number of Sample Measurements (N)	15	15	15	15	15
Standard Uncertainty (*u*)	0.010	0.02	0.09	0.006	0.005

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.

NEW YORK STATE | Department of Health | Wadsworth Center

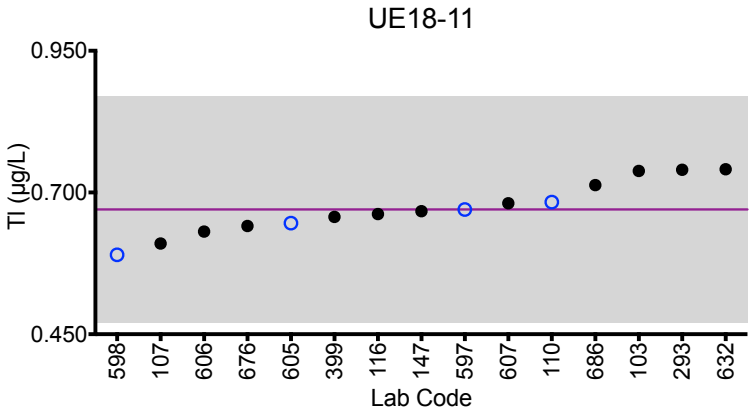
Results for Event #3, 2018:
Performance of Participating Laboratories

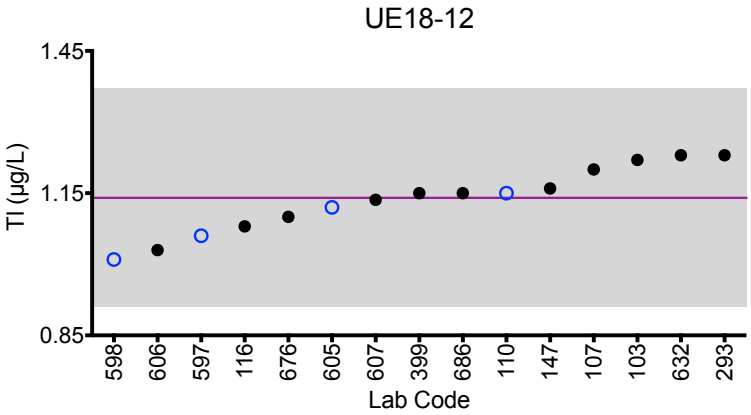
Urine Tl (µg/L)						
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
	Target	**0.670**	**1.14**	**4.55**	**0.401**	**0.275**
103	DRC/CC-ICP-MS	0.738	1.22	4.94	0.417	0.291
107	ICP-MS	0.61	1.2	4.4	0.4	0.27
110	ICP-MS	0.683	1.15	4.64	0.408	0.267
116	ICP-MS/MS	0.662	1.08	4.51	0.384	0.262
147	ICP-MS	0.667	1.16	4.61	0.398	0.283
293	DRC/CC-ICP-MS	0.74	1.23	4.95	0.43	0.29
399	ICP-MS	0.657	1.15	4.56	0.399	0.277
597	DRC/CC-ICP-MS	0.67	1.06	4.33	0.41	0.28
598	ICP-MS	0.59	1.01	4.07	0.32	0.22
605	ICP-MS	0.646	1.12	4.28	0.399	0.282
606	ICP-MS	0.631	1.03	4.21	0.362	0.251
607	ICP-MS	0.681	1.136	4.754	0.417	0.278
632	ICP-MS	0.741	1.23	4.87	0.425	0.294
676	ICP-MS	0.641	1.10	4.44	0.388	0.264
686	ICP-MS	0.713	1.15	4.64	0.400	0.280

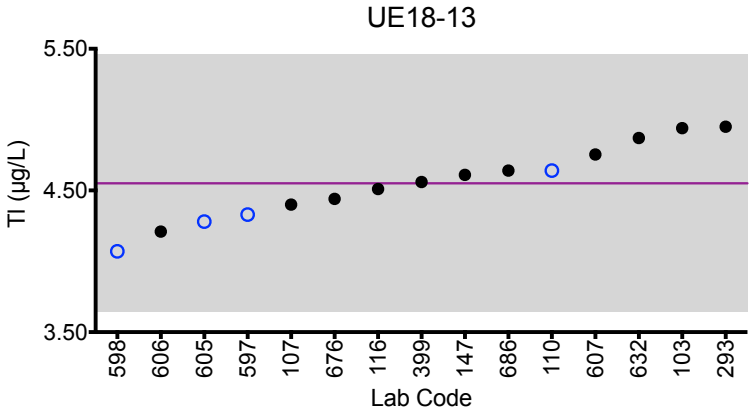
Based on the grading criteria for Tl in Urine, 100% of results were satisfactory, with 0 of the 15 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

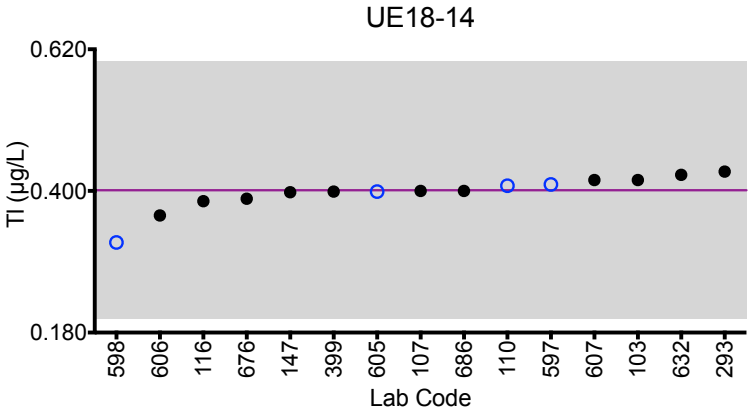
Results for Event #3, 2018: Summary Figures

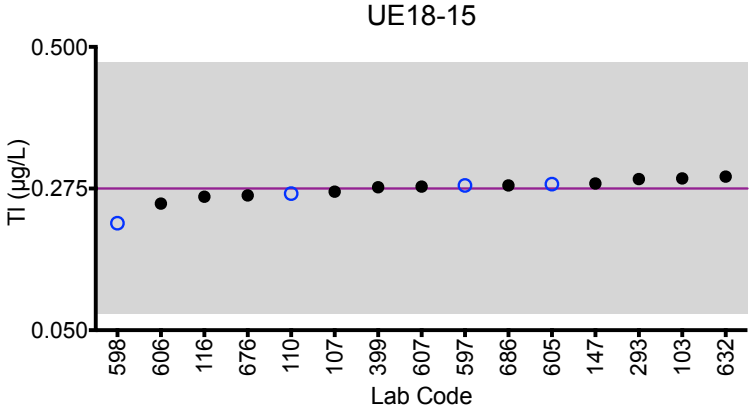
Urine Tl











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

	Urine U (µg/L)				
	UE18-11	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
Target (Robust Mean (x*))	0.0743	0.0619	0.213	0.0074	0.0307
Upper Limit	0.1043	0.0919	0.256	0.0374	0.0607
Lower Limit	0.0443	0.0319	0.170	0.0000	0.0007
Robust SD (s*)	0.0041	0.0027	0.012	0.0008	0.0024
Robust RSD (%)	5.5	4.4	5.6	11	7.8
Number of Sample Measurements (N)	18	18	18	11	18
Standard Uncertainty (*u*)	0.0010	0.0008	0.004	0.0003	0.0007

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.

NEW YORK STATE | Department of Health | Wadsworth Center

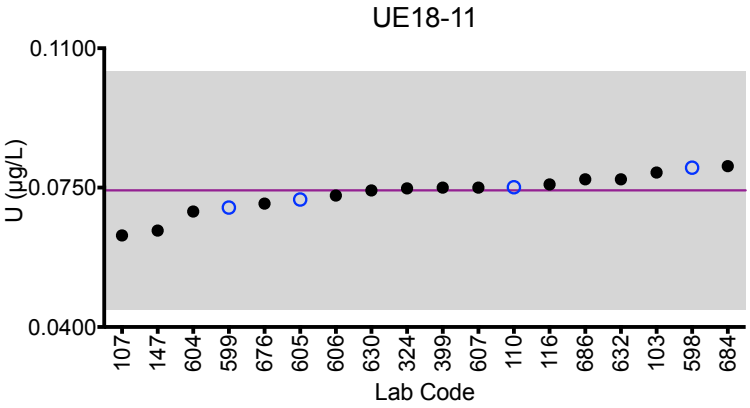
Results for Event #3, 2018:
Performance of Participating Laboratories

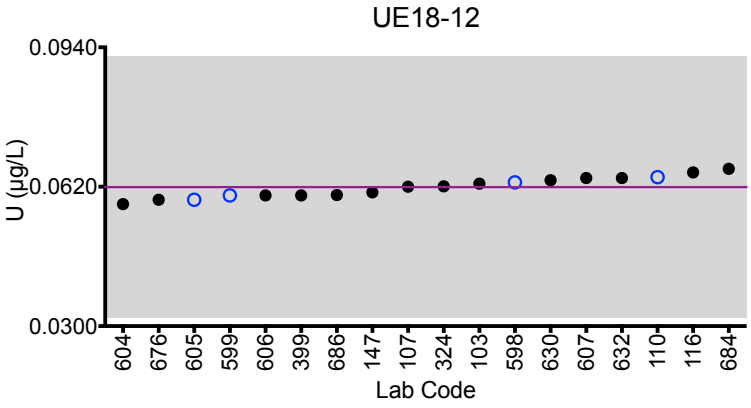
		Urine U (µg/L)				
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
	Target	**0.0743**	**0.0619**	**0.213**	**0.0074**	**0.0307**
103	DRC/CC-ICP-MS	0.0788	0.0627	0.224	< 0.0200	0.0309
107	ICP-MS	0.063	0.062	0.18	0.0086	0.032
110	ICP-MS	0.0751	0.0642	0.216	0.0076	0.0314
116	ICP-MS/MS	0.0758	0.0653	0.218	< 0.015	0.0337
147	ICP-MS	0.0642	0.0607	0.176	< 0.0164	0.0267
324	ICP-MS	0.0748	0.0621	0.2116	0.0072	0.0302
399	ICP-MS	0.075	0.06	0.231	0.007	0.035
598	ICP-MS	0.080	0.063	0.214	0.007	0.030
599	DRC/CC-ICP-MS	0.07	0.060	0.18	0.01	0.03
604	ICP-MS	0.069	0.058	0.208	< 0.009	0.026
605	ICP-MS	0.072	0.059	0.203	0.007	0.031
606	ICP-MS	0.073	0.06	0.209	0.005	0.029
607	ICP-MS	0.075	0.064	0.213	0.008	0.033
630	ICP-MS	0.0743	0.0635	0.218	0.0067	0.0291
632	ICP-MS	0.0771	0.0640	0.215	<0.015	0.0324
676	ICP-MS	0.071	0.059	0.202	0.008	0.028
684	ICP-MS	0.0804	0.0661	0.243	<0.015	0.0331
686	ICP-MS	0.0771	0.0601	0.223	<0.0150	0.0299

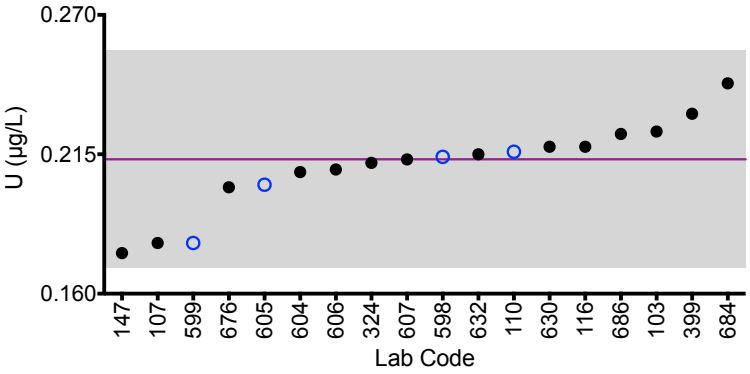
Based on the grading criteria for U in Urine, 100% of results were satisfactory, with 0 of the 18 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

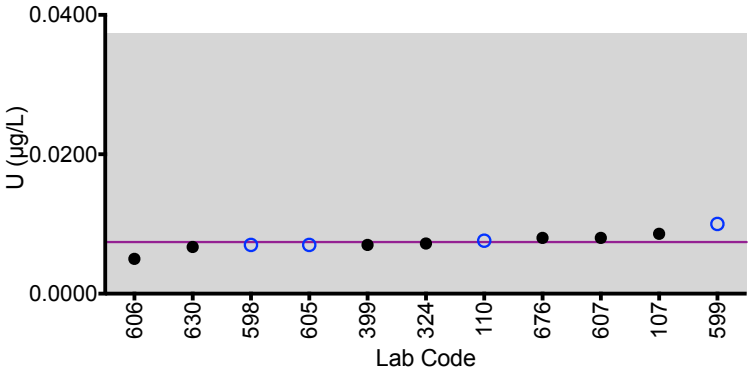
Results for Event #3, 2018: Summary Figures

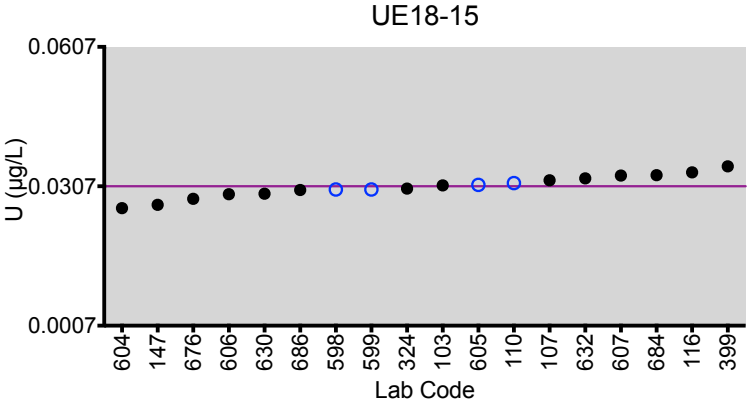
Urine U











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Urine Cs (µg/L)

Lab Code	Method	UE18-11	UE18-12	UE18-13	UE18-14	UE18-15
107	ICP-MS	6.9	1.7	3	13	7.7
110	ICP-MS	8.14	1.64	3.32	13.4	8.06
147	ICP-MS	7.37	1.48	3.06	13.0	7.60
399	ICP-MS	7.94	1.63	3.29	12.8	7.47
597	DRC/CC-ICP-MS	8.17	1.62	3.33	12.4	7.30
598	ICP-MS	7.48	1.52	3.09	12.29	7.28
599	DRC/CC-ICP-MS	8.20	1.61	3.25	12.8	7.67
605	ICP-MS	8.29	1.64	3.27	13.5	7.84
606	DRC/CC-ICP-MS	7.48	1.52	3.13	12.3	7.11
632	ICP-MS	8.41	1.69	3.43	13.7	8.08
676	ICP-MS	7.52	1.53	3.12	12.1	7.29

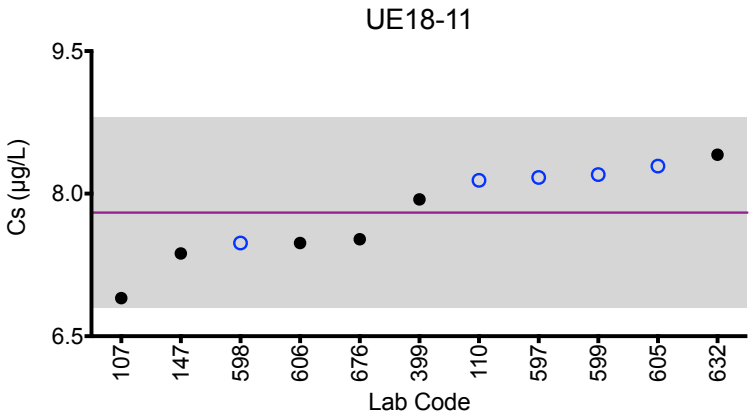
Summary Statistics

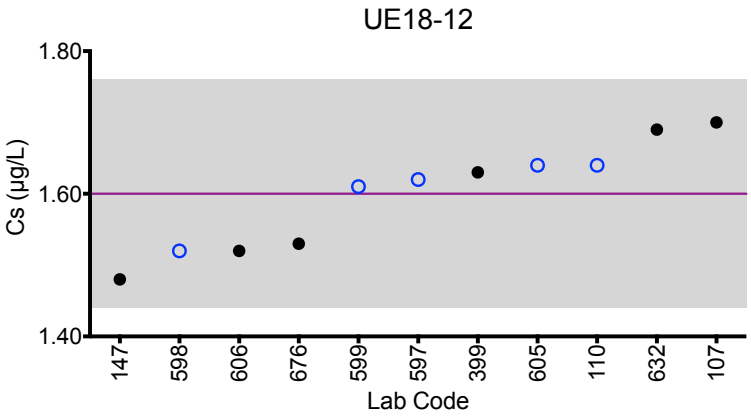
	UE18-11	UE18-12	UE18-13	UE18-14	UE18-15
Robust Mean (x*)	7.8	1.60	3.21	12.8	7.58
Robust SD (s*)	0.5	0.08	0.15	0.6	0.37
Robust RSD (%)	6.4	5.0	4.7	4.7	4.9
Number of Sample Measurements (N)	11	11	11	11	11
Standard Uncertainty (*u*)	0.2	0.03	0.06	0.2	0.10

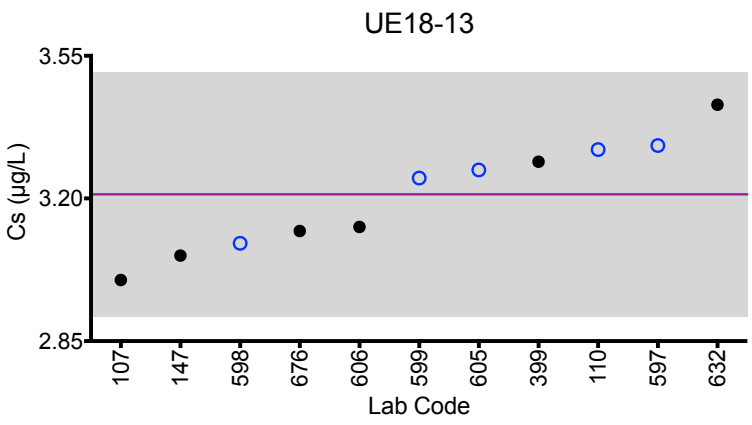
NEW YORK STATE | Department of Health | Wadsworth Center

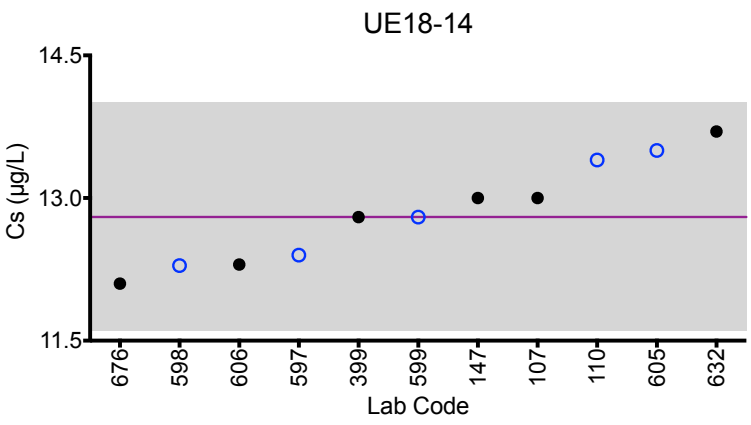
Results for Event #3, 2018: Summary Figures

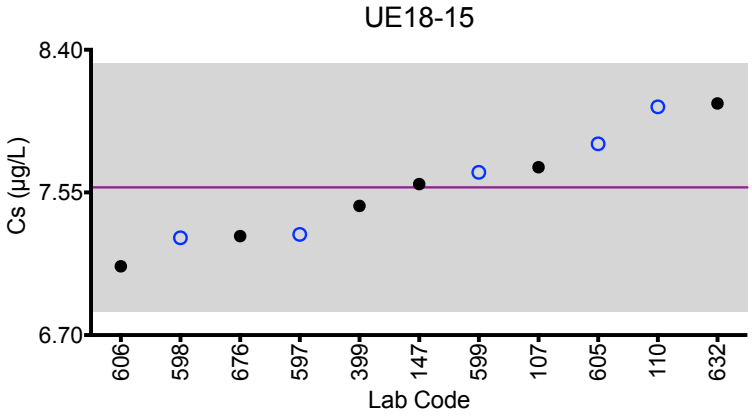
Urine Cs











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

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

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Urine Cu (µg/L)

Lab Code	Method	UE18-11	UE18-12	UE18-13	UE18-14	UE18-15
110	ICP-MS	10.4	64.5	48.4	22.0	14.6
116	ICP-MS/MS	5.85	51.4	39.3	16.7	9.79
147	ICP-MS	11.6	65.2	50.4	23.7	15.5
293	DRC/CC-ICP-MS	9.54	58.49	44.5	20.34	12.71
324	ICP-MS	9.119	62.202	47.456	22.133	14.360
391	ICP-MS	*86.252	35.273	76.084	50.598	22.843
401	DRC/CC-ICP-MS	7.63	59.7	45.1	19.1	11.4
597	DRC/CC-ICP-MS	10.4	63.4	51.4	24.3	15.1
598	ICP-MS	9.24	57.23	44.58	20.44	13.52
599	DRC/CC-ICP-MS	*46.1	56.2	47.9	19.6	12.7
632	ICP-MS	10.3	66.1	50.1	23.8	15.7

Summary Statistics

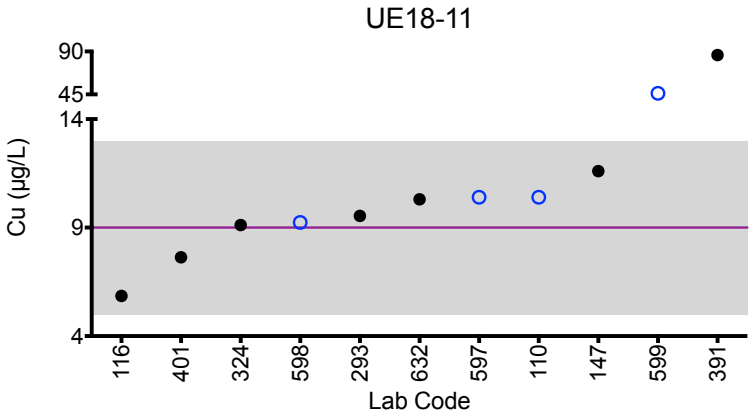
	UE18-11	UE18-12	UE18-13	UE18-14	UE18-15
Robust Mean (x*)	9	60	48	21.8	14.0
Robust SD (s*)	2	6	4	2.8	2.1
Robust RSD (%)	22	10	8.3	13	15
Number of Sample Measurements (N)	9	11	11	11	11
Standard Uncertainty (*u*)	NA	2	2	1.0	0.8

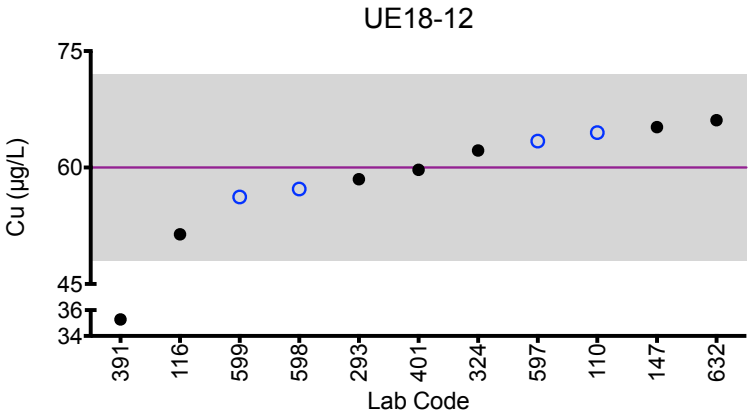
An arithmetic mean was calculated for UE18-11.

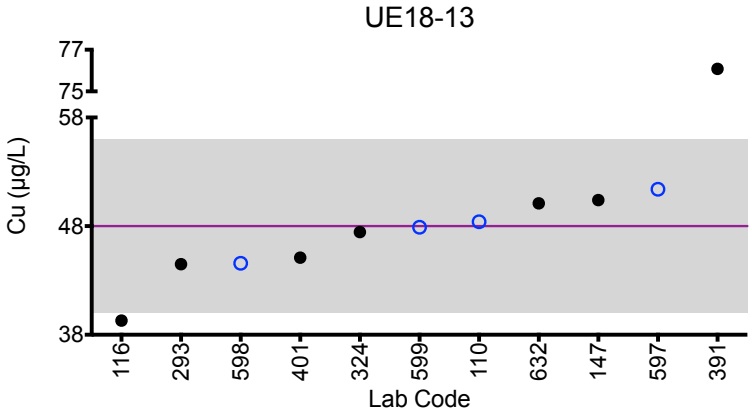
NEW YORK STATE | Department of Health | Wadsworth Center

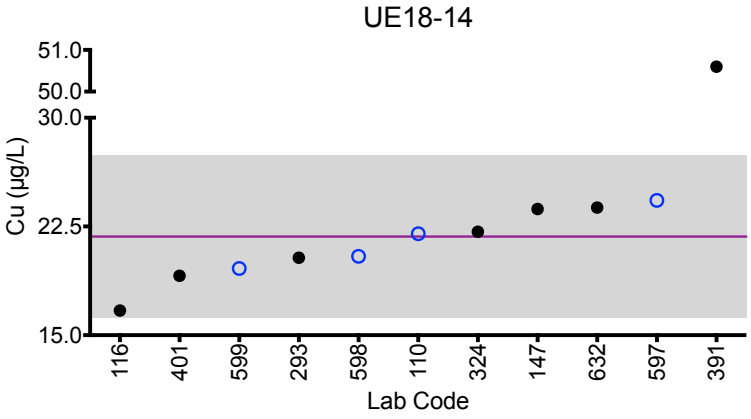
Results for Event #3, 2018: Summary Figures

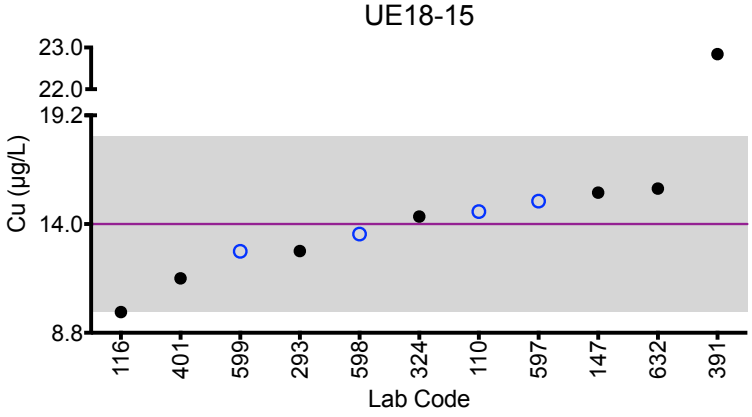
Urine Cu











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

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

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Urine Mo (µg/L)

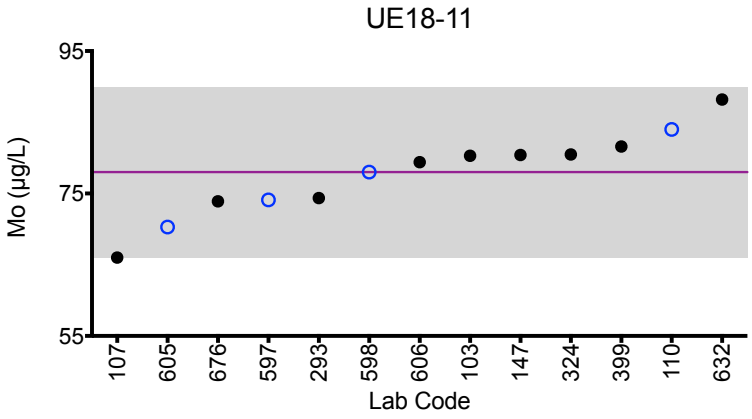
Lab Code	Method	UE18-11	UE18-12	UE18-13	UE18-14	UE18-15
103	DRC/CC-ICP-MS	80.3	157	22.8	36.8	230
107	ICP-MS	66	160	20	38	230
110	ICP-MS	84.0	166	24.5	39.2	245
147	ICP-MS	80.4	159	23.2	36.8	225
293	DRC/CC-ICP-MS	74.35	150.39	22.81	34.31	214.16
324	ICP-MS	80.482	158.769	23.395	38.514	235.959
399	ICP-MS	81.6	162	23.4	37.8	232
597	DRC/CC-ICP-MS	74.1	147	22.2	34.9	211
598	DRC/CC-ICP-MS	78.0	156.6	23.0	36.3	223.2
605	ICP-MS	70.3	142	21.0	34.5	210
606	DRC/CC-ICP-MS	79.4	156	22.7	37.4	229
632	ICP-MS	88.2	176	25.7	41.4	258
676	ICP-MS	73.9	147	21.8	34.2	210

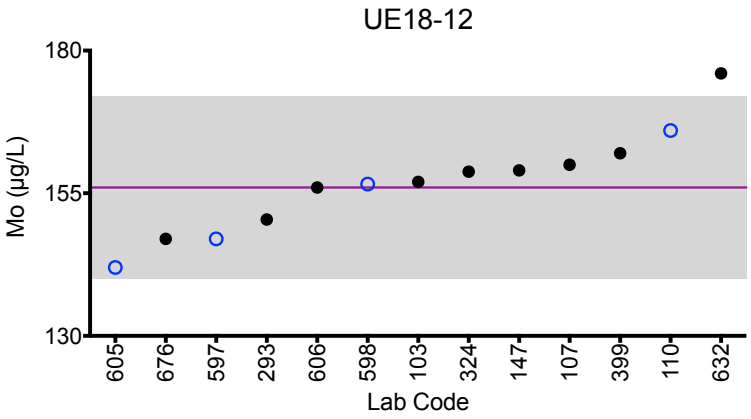
Summary Statistics

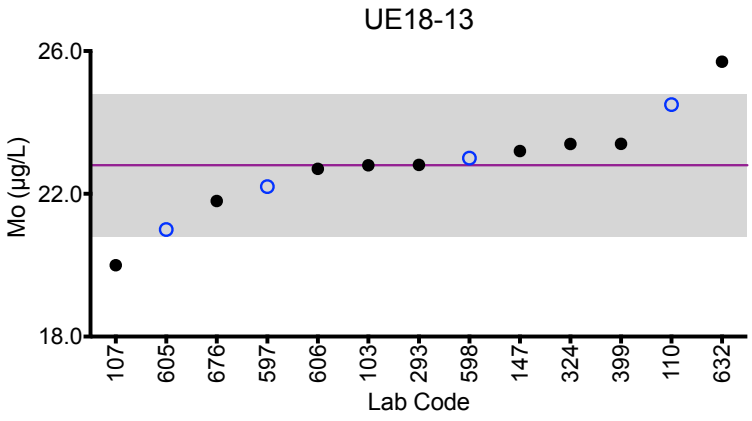
	UE18-11	UE18-12	UE18-13	UE18-14	UE18-15
Robust Mean (x*)	78	156	22.8	36.8	227
Robust SD (s*)	6	8	1.0	2.2	13
Robust RSD (%)	7.7	5.1	4.4	6.0	5.7
Number of Sample Measurements (N)	13	13	13	13	13
Standard Uncertainty (*u*)	2	3	0.3	0.8	4

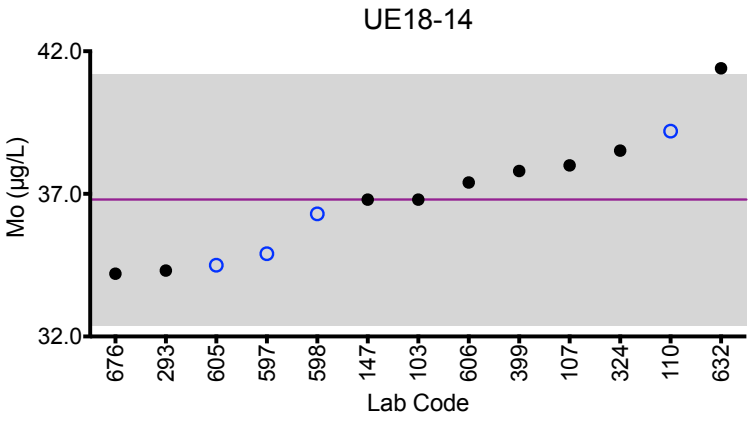
Results for Event #3, 2018: Summary Figures

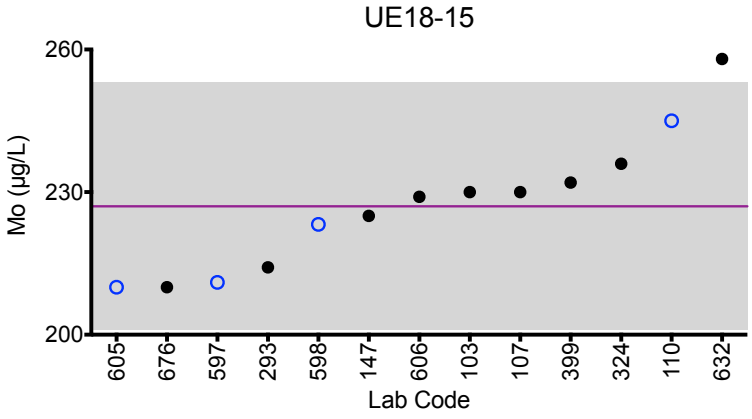
Urine Mo











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

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

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

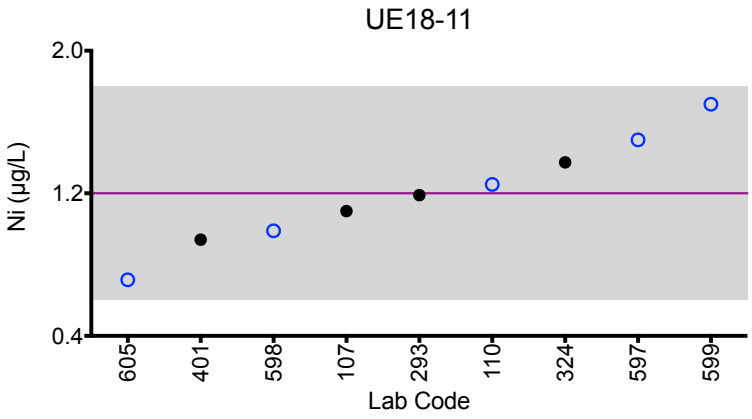
Urine Ni (µg/L)						
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
107	DRC/CC-ICP-MS	1.1	3.8	9	2.7	5
110	ICP-MS	1.25	4.59	8.92	3.55	5.88
293	DRC/CC-ICP-MS	1.19	4.2	8.74	3.64	5.17
324	ICP-MS	1.374	4.322	8.603	3.144	5.431
401	DRC/CC-ICP-MS	0.94	4.11	8.86	2.46	4.87
597	DRC/CC-ICP-MS	1.50	4.67	9.25	2.99	5.43
598	ICP-MS	0.99	4.04	8.57	3.17	5.63
599	DRC/CC-ICP-MS	1.70	4.36	9.71	2.94	5.57
605	ICP-MS	0.715	3.96	8.15	2.49	4.83
Summary Statistics						
		UE18-11	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
Arithmetic Mean ($\bar{x}$)		1.2	4.23	8.87	3.01	5.31
Arithmetic SD (s)		0.3	0.29	0.44	0.42	0.36
Arithmetic RSD (%)		25	6.9	5.0	14	6.8
Number of Sample Measurements (N)		9	9	9	9	9

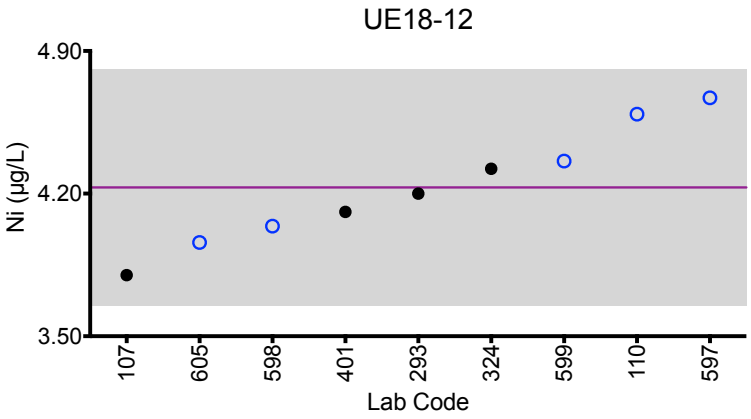
*Denotes a statistical Outlier.

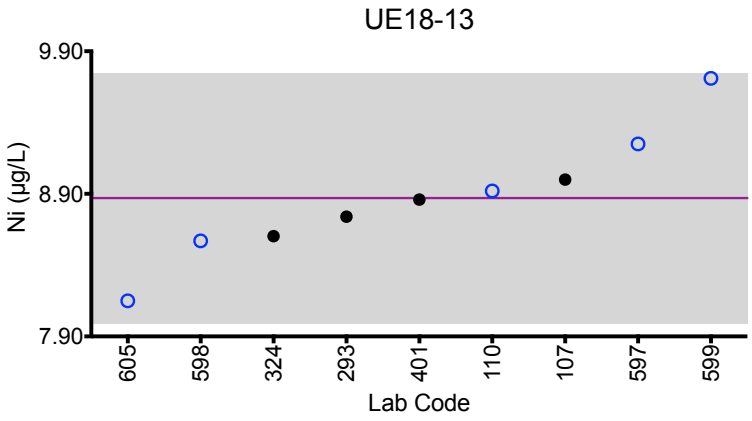
NEW YORK STATE | Department of Health | Wadsworth Center

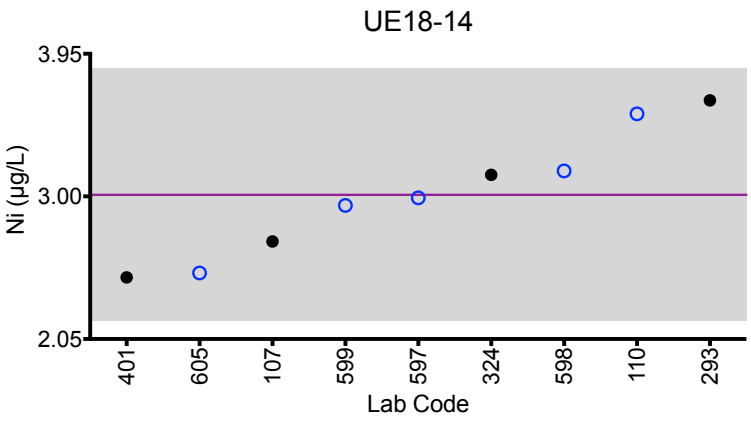
Results for Event #3, 2018: Summary Figures

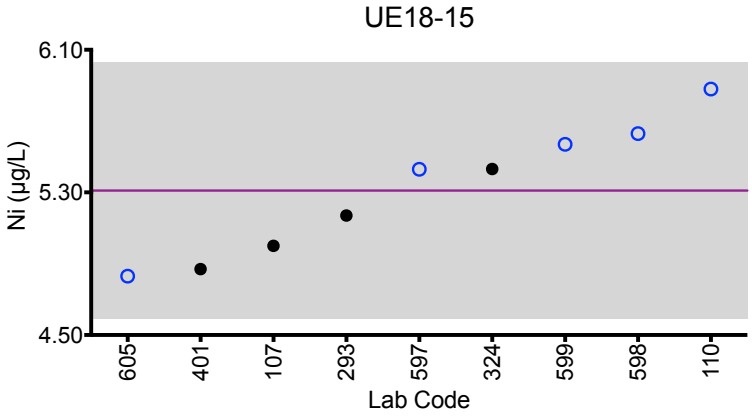
Urine Ni











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Urine Pt (µg/L)

Lab Code	Method	UE18-11	UE18-12	UE18-13	UE18-14	UE18-15
107	ICP-MS	0.43	6	0.88	3.9	0.55
110	ICP-MS	0.422	5.81	0.831	3.94	0.480
147	ICP-MS	0.352	5.45	0.883	3.88	0.525
399	ICP-MS	0.407	5.76	0.819	3.96	0.483
598	ICP-MS	0.42	5.29	0.78	*3.13	0.43
605	ICP-MS	0.389	5.60	0.803	3.74	0.468
632	ICP-MS	0.417	5.71	0.830	3.73	0.496
676	ICP-MS	0.397	5.58	0.800	3.67	0.470

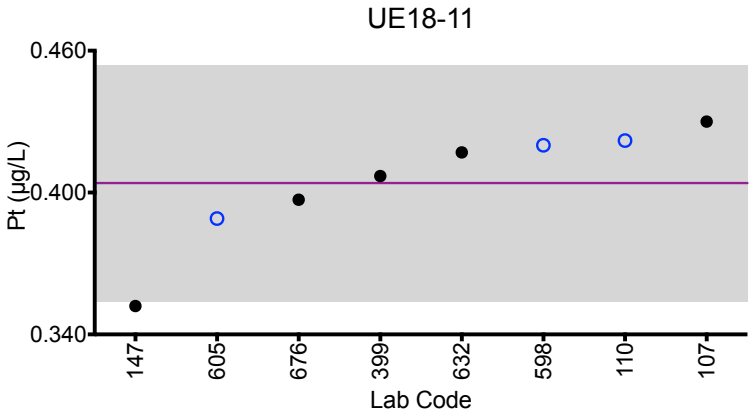
Summary Statistics

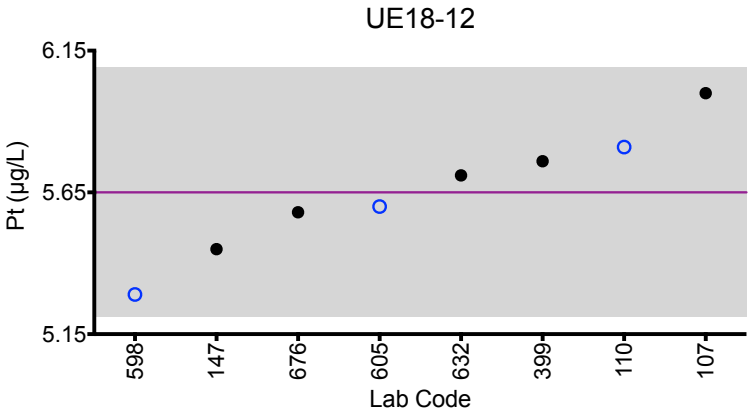
	UE18-11	UE18-12	UE18-13	UE18-14	UE18-15
Arithmetic Mean ($\bar{x}$)	0.404	5.65	0.828	3.83	0.488
Arithmetic SD (s)	0.025	0.22	0.037	0.12	0.037
Arithmetic RSD (%)	6.2	3.9	4.5	3.1	7.6
Number of Sample Measurements (N)	8	8	8	7	8

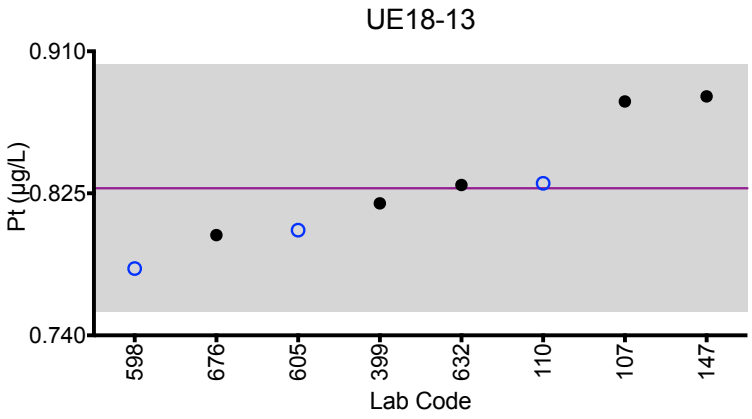
*Denotes a statistical Outlier.

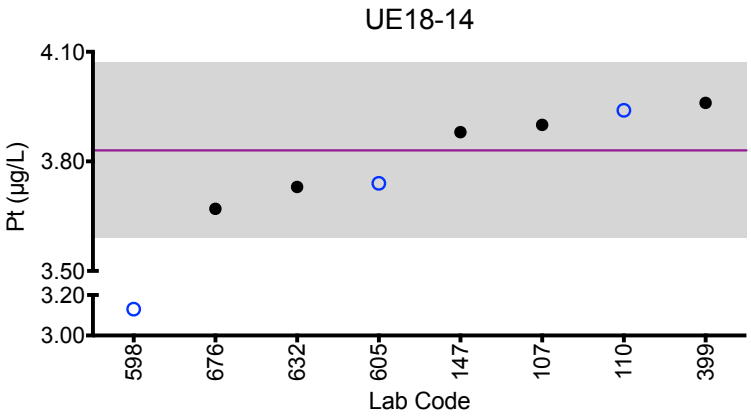
Results for Event #3, 2018: Summary Figures

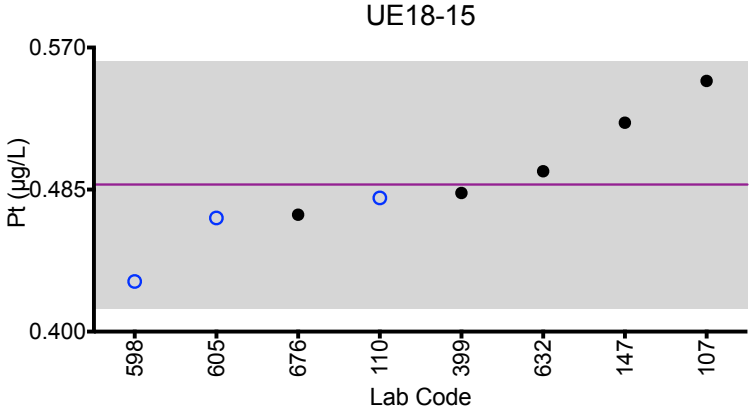
Urine Pt











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Urine Sb (µg/L)

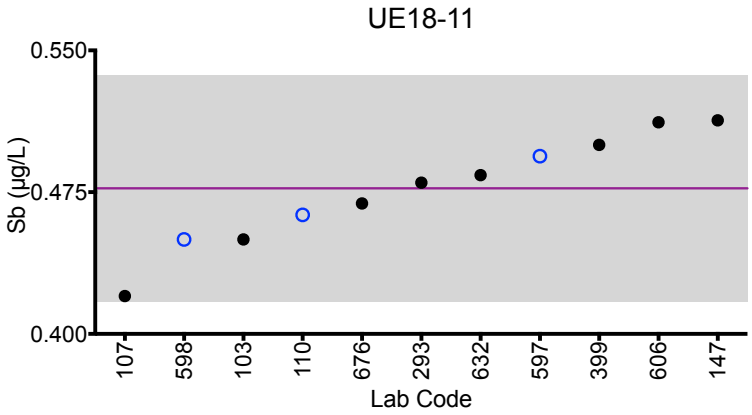
Lab Code	Method	UE18-11	UE18-12	UE18-13	UE18-14	UE18-15
103	DRC/CC-ICP-MS	0.450	2.60	1.62	0.244	0.718
107	ICP-MS	0.42	2.8	1.5	0.32	0.78
110	ICP-MS	0.463	2.58	1.59	0.293	0.718
147	ICP-MS	0.513	2.72	1.64	0.315	0.776
293	DRC/CC-ICP-MS	0.48	2.46	1.53	0.27	0.71
399	ICP-MS	0.5	2.65	1.59	0.278	0.762
597	DRC/CC-ICP-MS	0.494	2.46	1.56	0.327	0.758
598	ICP-MS	0.45	2.57	1.56	0.27	0.69
606	DRC/CC-ICP-MS	0.512	2.65	1.57	0.297	0.705
632	ICP-MS	0.484	2.78	1.68	0.392	0.790
676	ICP-MS	0.469	2.53	1.54	0.277	0.730

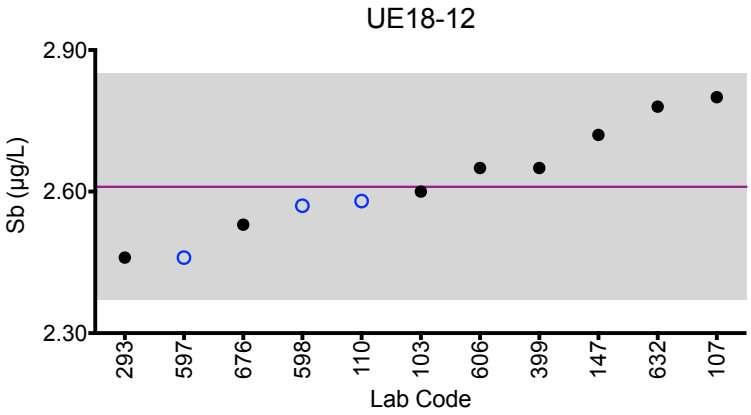
Summary Statistics

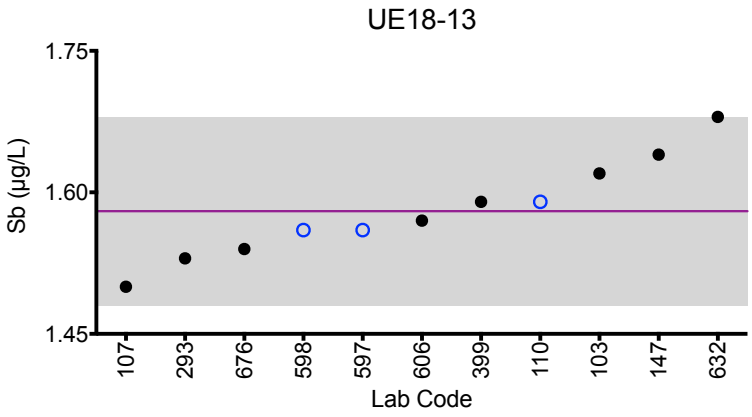
	UE18-11	UE18-12	UE18-13	UE18-14	UE18-15
Robust Mean (x*)	0.477	2.61	1.58	0.294	0.740
Robust SD (s*)	0.030	0.12	0.05	0.034	0.039
Robust RSD (%)	6.3	4.6	3.2	12	5.3
Number of Sample Measurements (N)	11	11	11	11	11
Standard Uncertainty (*u*)	0.010	0.05	0.02	0.010	0.010

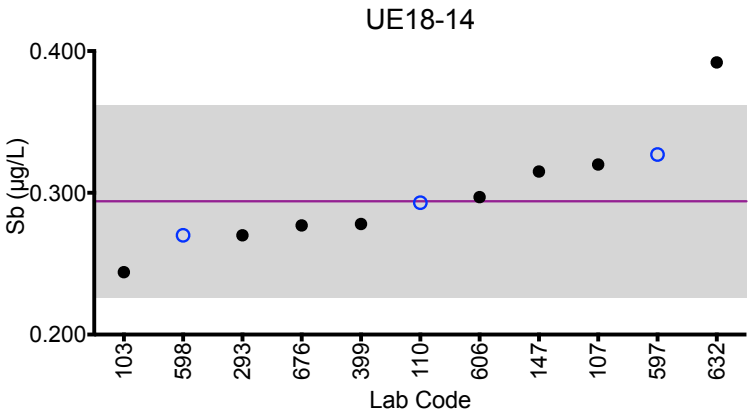
Results for Event #3, 2018: Summary Figures

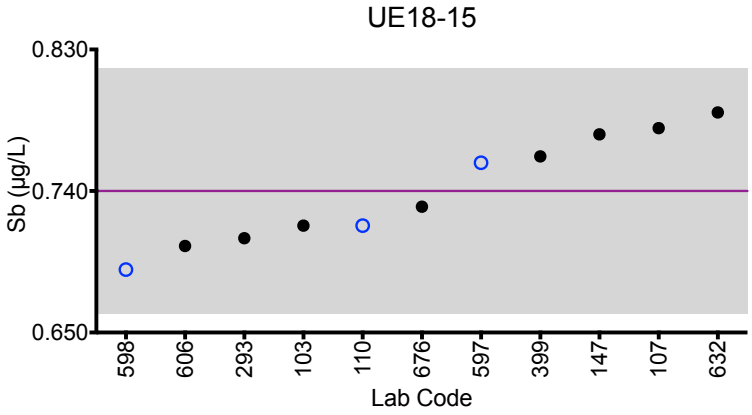
Urine Sb











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

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

Results for Event #3, 2018: Laboratory Data and Summary Statistics

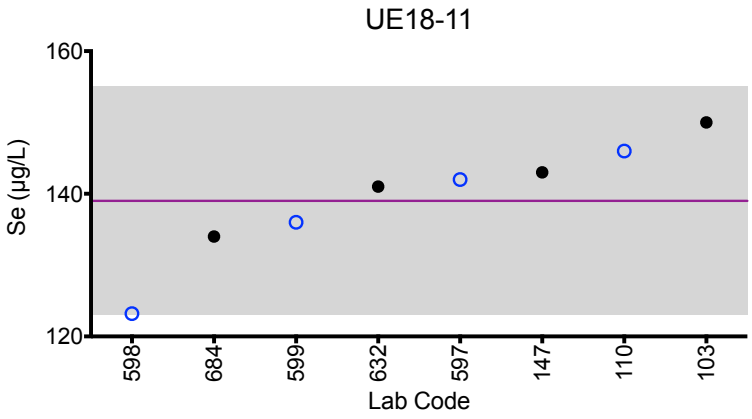
Urine Se (µg/L)						
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
103	DRC/CC-ICP-MS	150	87.0	191	30.3	52.2
110	DRC/CC-ICP-MS	146	84.1	187	32.6	55.9
147	ICP-MS	143	83.7	188	29.9	50.5
597	DRC/CC-ICP-MS	142	83.2	178	37.2	61.4
598	DRC/CC-ICP-MS	123.2	74.9	170.9	24.5	44.3
599	DRC/CC-ICP-MS	136	82.1	180.2	29.9	50.1
632	DRC/CC-ICP-MS	141	84.0	181	26.9	50.3
684	DRC/CC-ICP-MS	134	77.7	171	31.7	53.1
Summary Statistics						
		UE18-11	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
Arithmetic Mean ($\bar{x}$)		139	82.1	181	30.4	52
Arithmetic SD (s)		8	3.9	8	3.8	5
Arithmetic RSD (%)		5.8	4.8	4.4	13	9.6
Number of Sample Measurements (N)		8	8	8	8	8

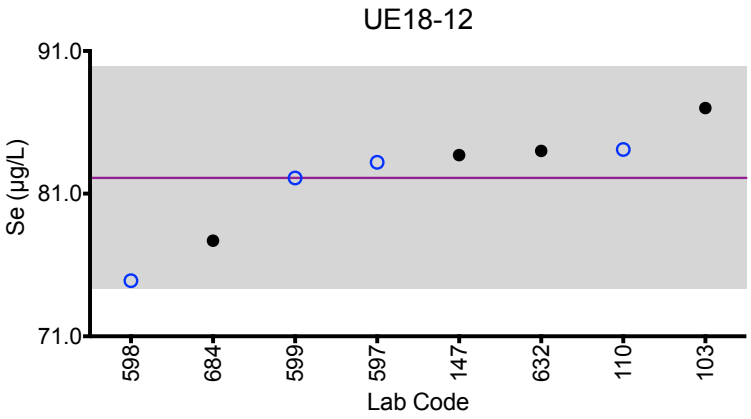
*Denotes a statistical Outlier.

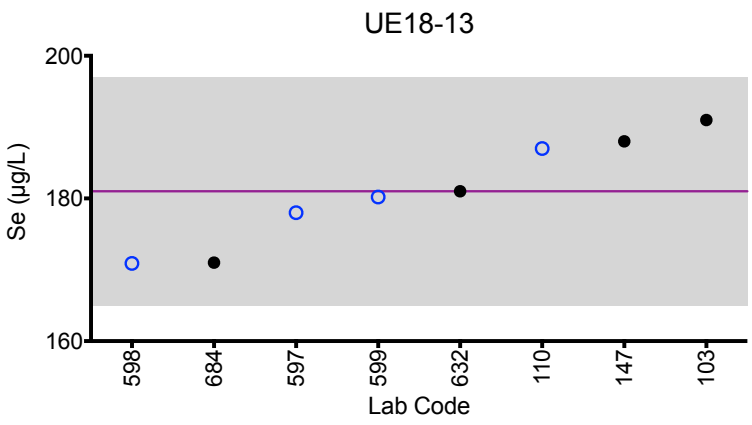
NEW YORK STATE | Department of Health | Wadsworth Center

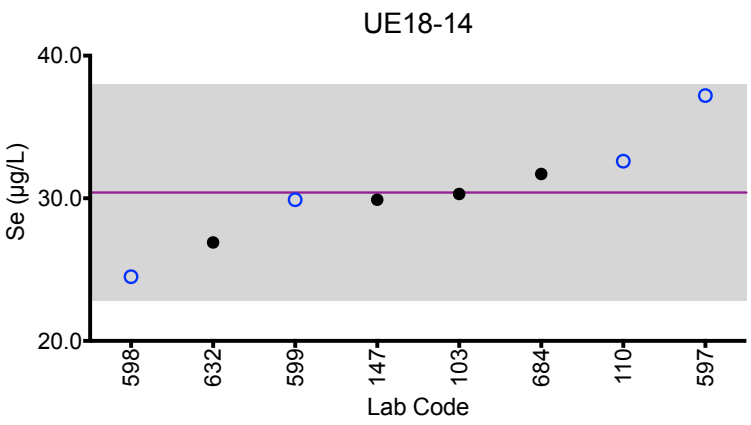
Results for Event #3, 2018: Summary Figures

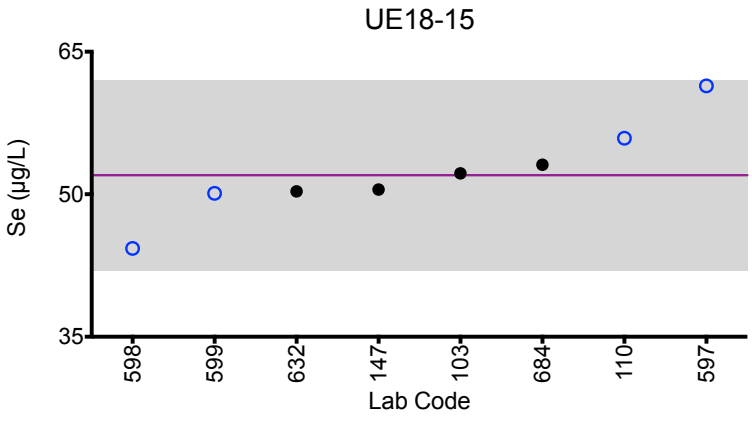
Urine Se











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Urine Sn (µg/L)

Lab Code	Method	UE18-11	UE18-12	UE18-13	UE18-14	UE18-15
107	ICP-MS	5.1	4.3	0.98	2.8	5.8
110	ICP-MS	5.92	3.97	1.02	2.61	5.62
147	ICP-MS	6.22	4.37	1.15	2.74	5.72
399	ICP-MS	6.34	4.46	1.08	2.85	5.80
597	DRC/CC-ICP-MS	*3.58	3.95	1.23	2.82	5.60
598	ICP-MS	5.60	3.87	1.00	2.53	5.37
676	ICP-MS	5.65	3.87	1.01	2.53	5.41

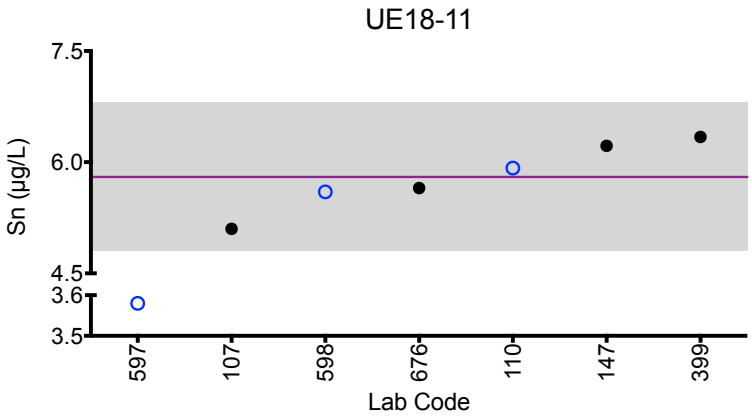
Summary Statistics

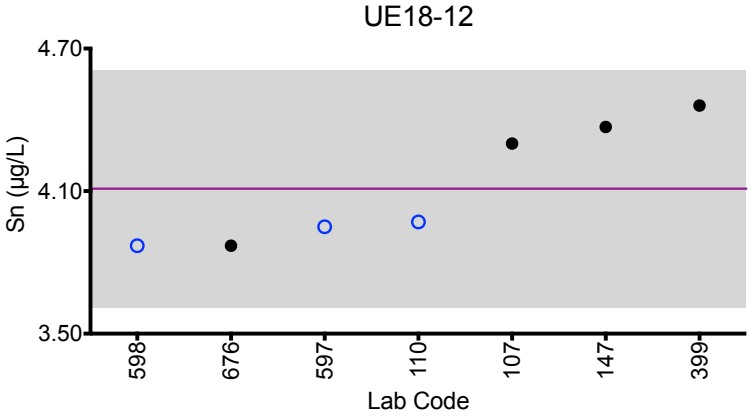
	UE18-11	UE18-12	UE18-13	UE18-14	UE18-15
Arithmetic Mean ($\bar{x}$)	5.8	4.11	1.07	2.70	5.62
Arithmetic SD (s)	0.5	0.25	0.09	0.14	0.17
Arithmetic RSD (%)	8.6	6.1	8.4	5.2	3.0
Number of Sample Measurements (N)	6	7	7	7	7

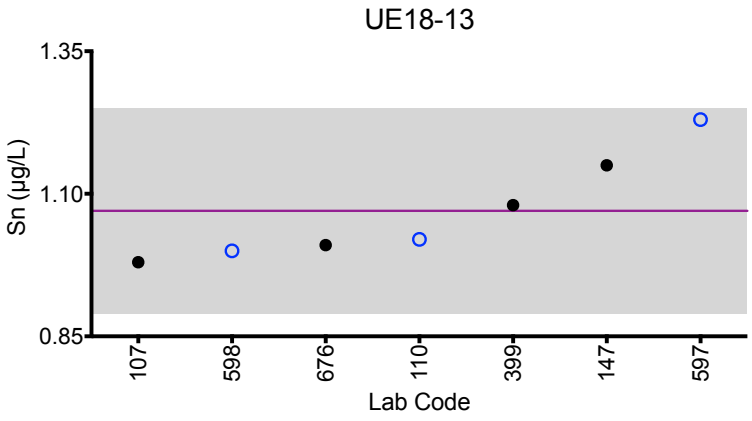
*Denotes a statistical Outlier.

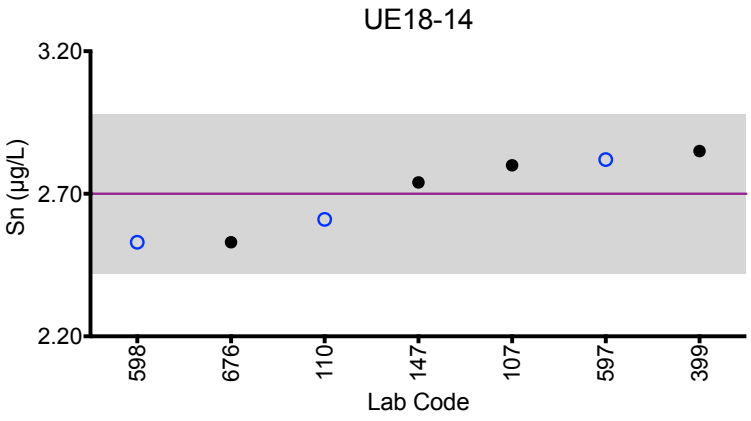
Results for Event #3, 2018: Summary Figures

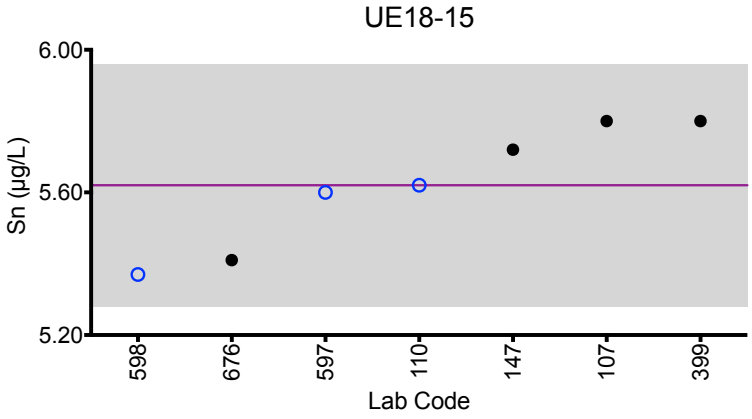
Urine Sn











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

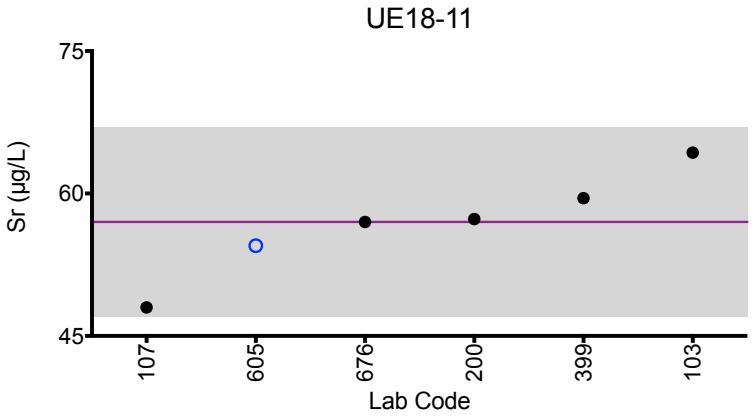
Urine Sr (µg/L)						
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
103	DRC/CC-ICP-MS	64.3	154	236	87.4	112
107	ICP-MS	48	140	180	84	110
200	ICP-MS	57.3	140.2	215.5	80.6	104.2
399	DRC/CC-ICP-MS	59.5	144	217	86.0	108
605	ICP-MS	54.5	133	199	79.1	99.2
676	ICP-MS	57.0	139	208	80.1	102
Summary Statistics						
		UE18-11	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
Arithmetic Mean ($\bar{x}$)		57	142	209	82.9	106
Arithmetic SD (s)		5	7	19	3.4	5
Arithmetic RSD (%)		8.8	4.9	9.1	4.1	4.7
Number of Sample Measurements (N)		6	6	6	6	6

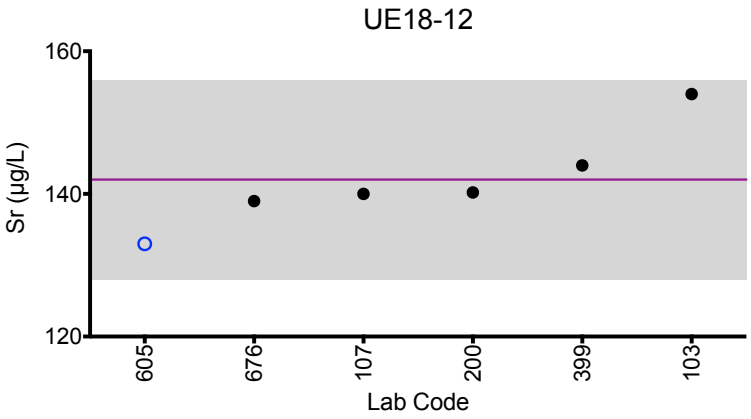
*Denotes a statistical Outlier.

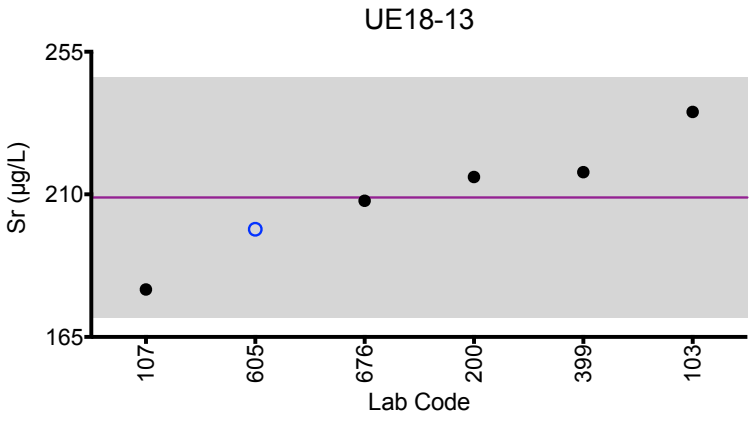
NEW YORK STATE | Department of Health | Wadsworth Center

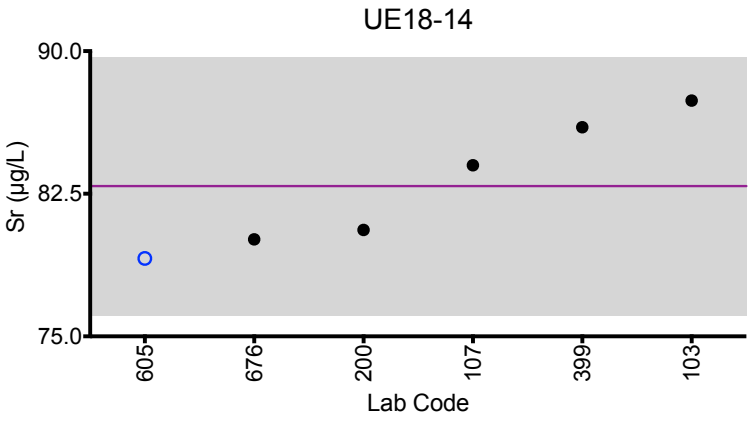
Results for Event #3, 2018: Summary Figures

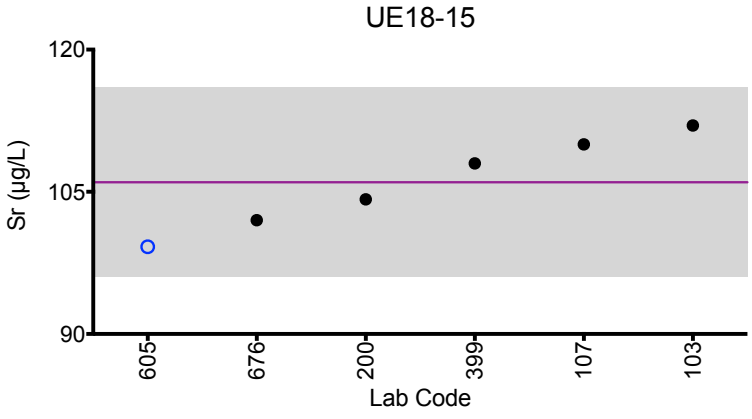
Urine Sr











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Urine V (µg/L)

Lab Code	Method	UE18-11	UE18-12	UE18-13	UE18-14	UE18-15
116	ICP-MS/MS	0.605	1.2	3.22	1.66	0.389
147	DRC/CC-ICP-MS	0.664	1.37	3.37	1.83	0.479
293	DRC/CC-ICP-MS	0.82	1.5	3.67	2.03	0.68
597	DRC/CC-ICP-MS	0.744	1.38	3.48	1.83	0.565
598	DRC/CC-ICP-MS	0.81	1.51	4.02	2.19	0.55
605	ICP-MS	0.688	1.29	3.47	2.00	0.475

Summary Statistics

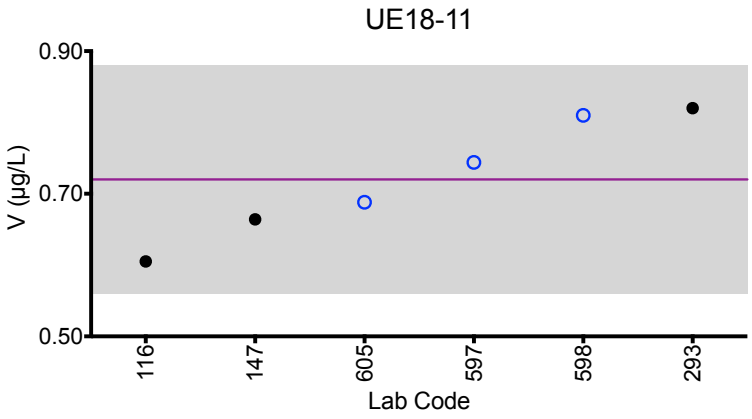
	UE18-11	UE18-12	UE18-13	UE18-14	UE18-15
Arithmetic Mean ($\bar{x}$)	0.72	1.38	3.54	1.92	0.52
Arithmetic SD (s)	0.08	0.12	0.28	0.19	0.10
Arithmetic RSD (%)	11	8.7	7.9	9.9	19
Number of Sample Measurements (N)	6	6	6	6	6

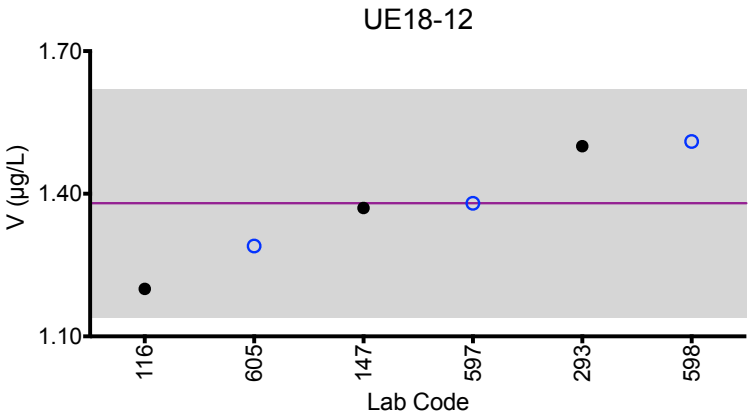
*Denotes a statistical Outlier.

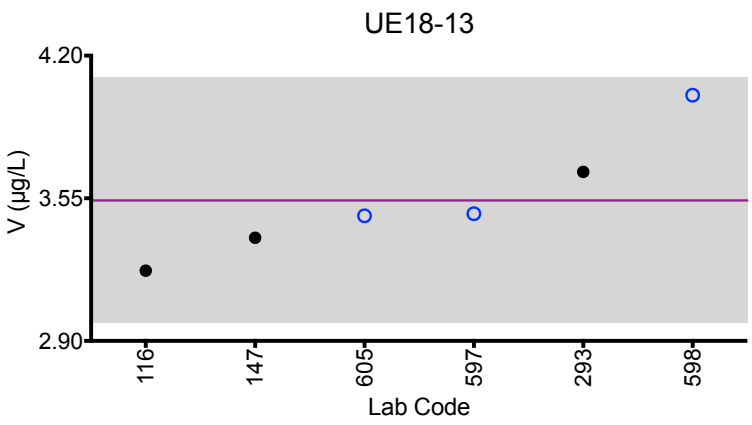
NEW YORK STATE | Department of Health | Wadsworth Center

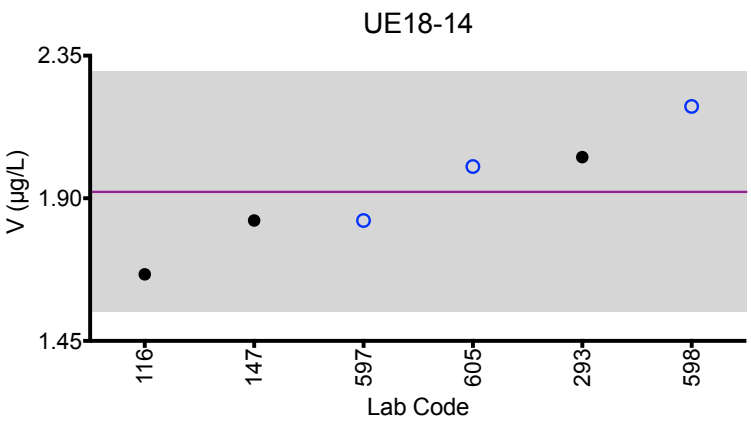
Results for Event #3, 2018: Summary Figures

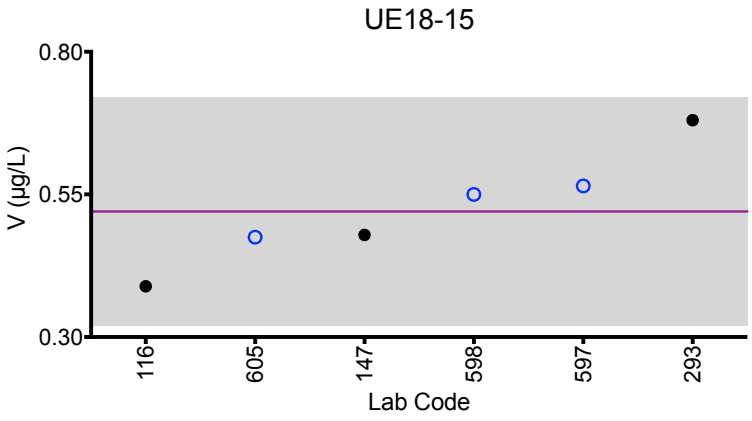
Urine V











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Urine W (µg/L)

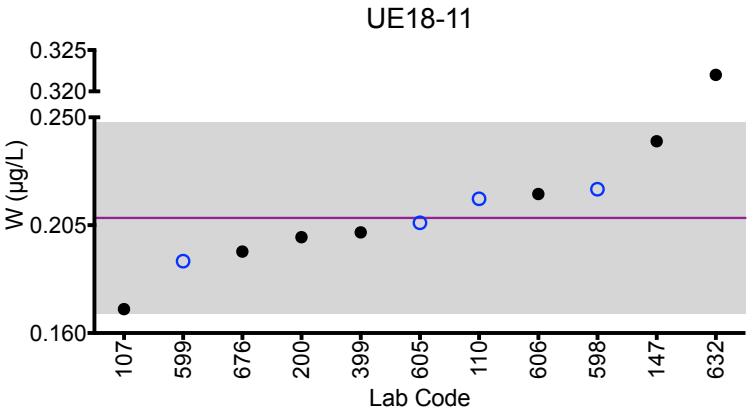
Lab Code	Method	UE18-11	UE18-12	UE18-13	UE18-14	UE18-15
107	ICP-MS	0.17	0.46	0.22	0.14	0.18
110	ICP-MS	0.216	0.457	0.264	0.133	0.193
147	ICP-MS	0.240	0.533	0.284	0.162	0.195
200	ICP-MS	0.2	0.45	0.23	0.13	0.17
324	ICP-MS	<1	<1	<1	<1	<1
399	ICP-MS	0.202	0.464	0.258	0.128	0.185
598	ICP-MS	0.220	0.459	0.265	0.140	0.198
599	DRC/CC-ICP-MS	0.19	0.38	0.22	0.12	0.17
605	ICP-MS	0.206	0.402	0.227	<0.180	<0.180
606	DRC/CC-ICP-MS	0.218	0.465	0.249	0.139	0.189
632	ICP-MS	0.322	0.559	0.367	0.238	0.289
676	ICP-MS	0.194	0.422	0.254	0.125	0.166

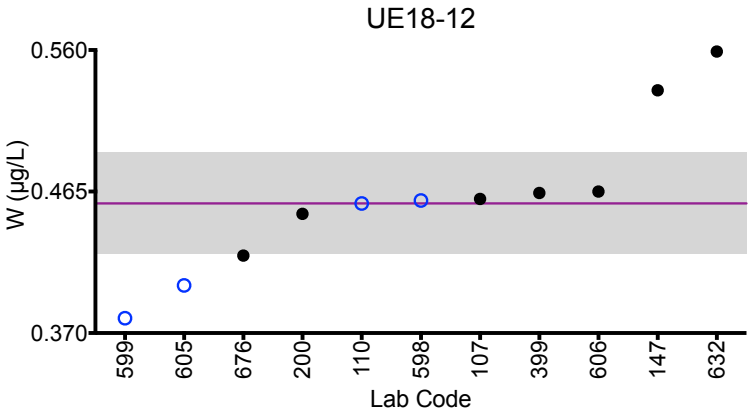
Summary Statistics

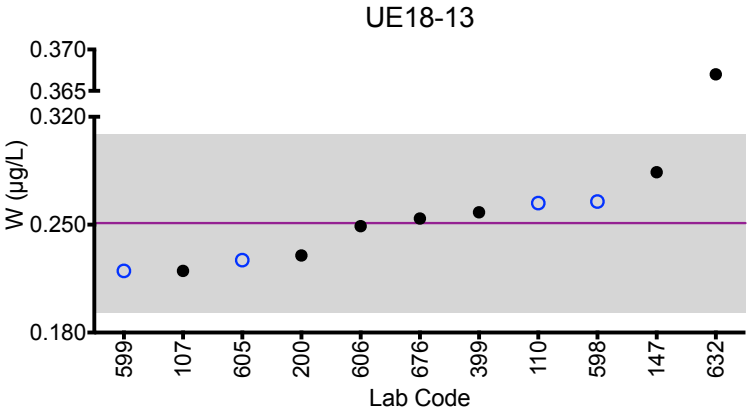
	UE18-11	UE18-12	UE18-13	UE18-14	UE18-15
Robust Mean (x*)	0.208	0.457	0.251	0.136	0.185
Robust SD (s*)	0.020	0.017	0.029	0.012	0.016
Robust RSD (%)	9.6	3.7	12	8.8	8.6
Number of Sample Measurements (N)	11	11	11	10	10
Standard Uncertainty (*u*)	0.007	0.006	0.010	0.005	0.006

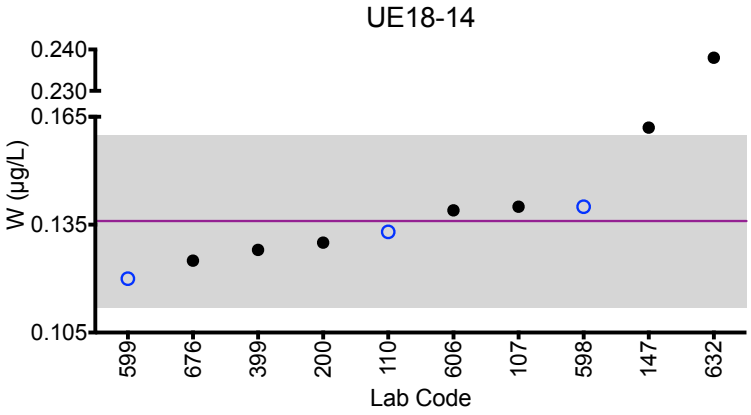
Results for Event #3, 2018: Summary Figures

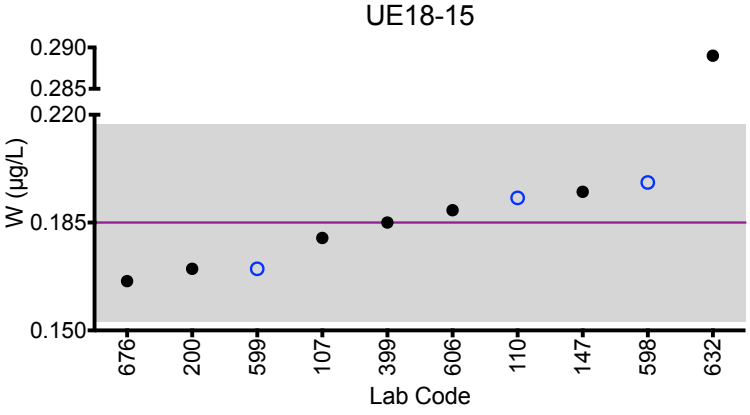
Urine W











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

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

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

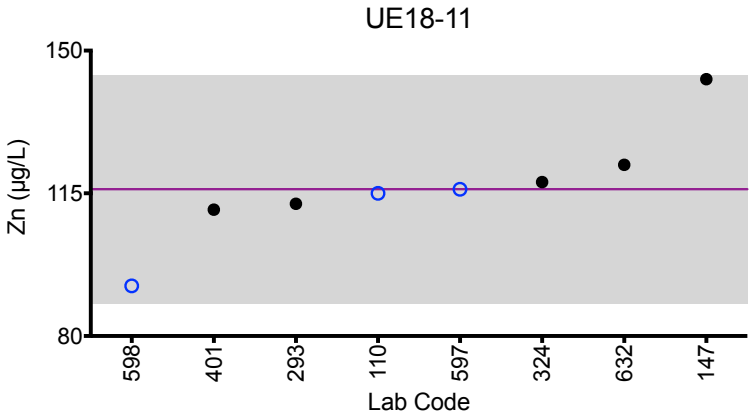
Urine Zn (µg/L)						
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
110	ICP-MS	115	721	373	212	668
147	ICP-MS	143	827	443	253	741
293	DRC/CC-ICP-MS	112.42	715.69	375.82	227.45	686.93
324	ICP-MS	117.771	650.937	343.449	191.639	604.696
401	DRC/CC-ICP-MS	111	739	386	216	713
597	DRC/CC-ICP-MS	116	731	405	241	728
598	ICP-MS	92.3	612	319	184	587
632	ICP-MS	122	768	398	238	759
Summary Statistics						
		UE18-11	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
Arithmetic Mean ($\bar{x}$)		116	720	380	220	690
Arithmetic SD (s)		14	70	38	24	60
Arithmetic RSD (%)		12	9.7	10	11	8.7
Number of Sample Measurements (N)		8	8	8	8	8

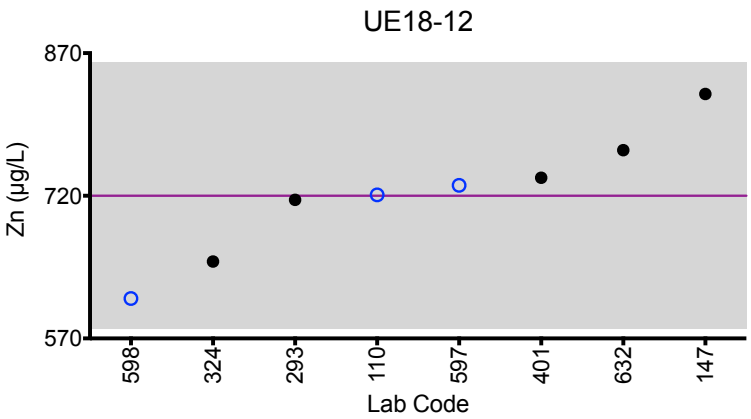
*Denotes a statistical Outlier.

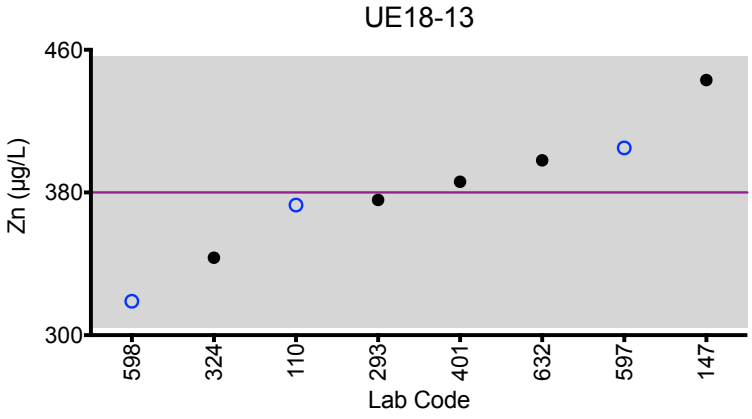
NEW YORK STATE | Department of Health | Wadsworth Center

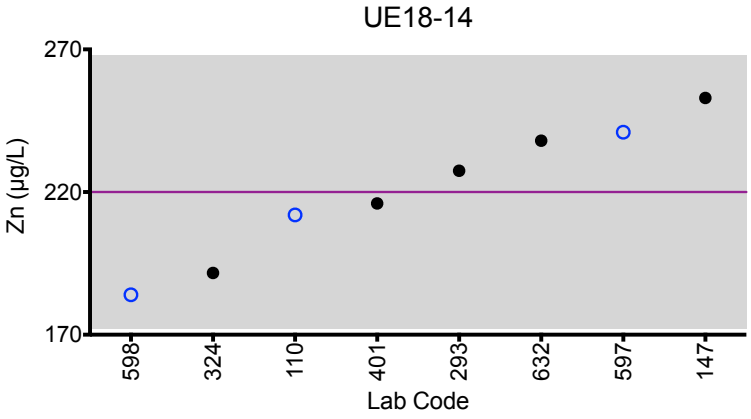
Results for Event #3, 2018: Summary Figures

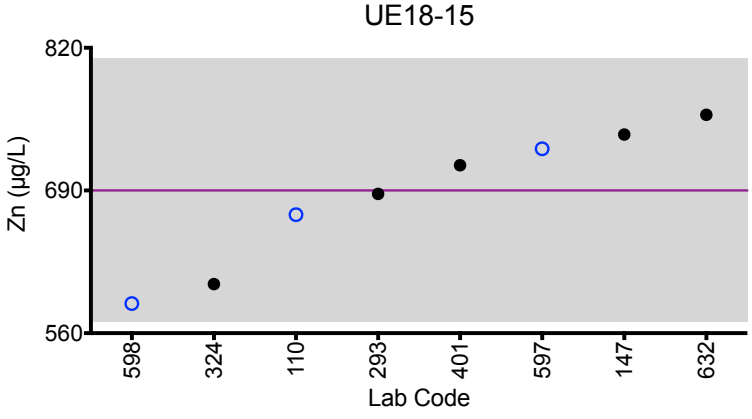
Urine Zn











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Urine Al (µg/L)						
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
147	DRC/CC-ICP-MS	< 18.1	*26.1	18.9	< 18.1	< 18.1
324	ICP-MS	10.466	10.979	16.037	11.192	15.287
597	DRC/CC-ICP-MS	12.2	8.31	19.31	7.73	9.90
Summary Statistics						
		UE18-11	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
Arithmetic Mean ($\bar{x}$)		11.3	9.6	18.1	9	13
Arithmetic SD (s)		1.2	1.9	1.8	2	4
Arithmetic RSD (%)		11	20	9.9	22	31
Number of Sample Measurements (N)		2	2	3	2	2

*Denotes a statistical Outlier.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Additional Elements in Urine

Urine Ag (µg/L)						
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
147	ICP-MS	< 0.507	< 0.507	< 0.507	< 0.507	< 0.507
Urine B (µg/L)						
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
200	ICP-MS	234	226	195	922	862
Urine Bi (µg/L)						
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
147	ICP-MS	< 0.293	< 0.293	< 0.293	< 0.293	< 0.293
Urine Fe (µg/L)						
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
324	ICP-MS	12.119	3.866	5.408	2.847	5.865
Urine I (µg/L)						
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
107	ICP-MS	21.4	21.6	20.2	92.8	89.4
Urine Li (µg/L)						
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
147	ICP-MS	3.91	4.03	3.84	11.7	11.5
Urine Mg (µg/L)						
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
597	DRC/CC-ICP-MS	9370	9350	9300	36600	37100
Urine Te (µg/L)						
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
110	ICP-MS	0.399	2.67	0.748	<0.083	1.44
Urine Th (µg/L)						
Lab Code	**Method**	**UE18-11**	**UE18-12**	**UE18-13**	**UE18-14**	**UE18-15**
147	ICP-MS	< 0.00719	< 0.00719	< 0.00719	< 0.00719	< 0.00719

NEW YORK STATE | Department of Health | Wadsworth Center

Event #3, 2018

Trace Elements in Serum

Wadsworth Center
NEW YORK STATE DEPARTMENT OF HEALTH
Trace Elements Laboratory

Event #3, 2018:
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). Serum units were homogenized overnight prior to aliquoting 2-mL into polypropylene vials. PT samples were stored at -80°C until the week of the PT event, when they were thawed at 4°C prior to circulation to laboratories for analysis.

Graded Elements

Six elements in serum are formally graded: Al, Co, Cr, Cu, Se, and Zn. Target values for the graded elements are assigned to these pools based on (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 28 were reported by at least one participant: Ag, As, B, Ba, Be, Bi, Cd, Cs, Fe, Hg, I, Li, Mg, Mn, Mo, Ni, Pb, Pt, Sb, Sn, Sr, Te, Th, Ti, Tl, U, V, and W. These data are included here to provide a more complete characterization of the PT materials. All results reported by participant laboratories are tabulated and organized by lab code. The PT data are graphed for visual comparison purposes for all elements where at least five laboratories reported a value greater than the LOD. A statistical summary table is provided for samples where at least two comparable values were reported as above the LOD.

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

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

	Serum Al (µg/L)				
	SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Target (Arithmetic Mean ($\bar{x}$))	119	143	75	200	42
Upper Limit	143	172	90	240	50
Lower Limit	95	114	60	160	34
Arithmetic SD (s)	20	16	12	20	11
Arithmetic RSD (%)	17	11	16	10	26
Number of Sample Measurements (N)	6	6	6	6	6

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

NEW YORK STATE | Department of Health | Wadsworth Center

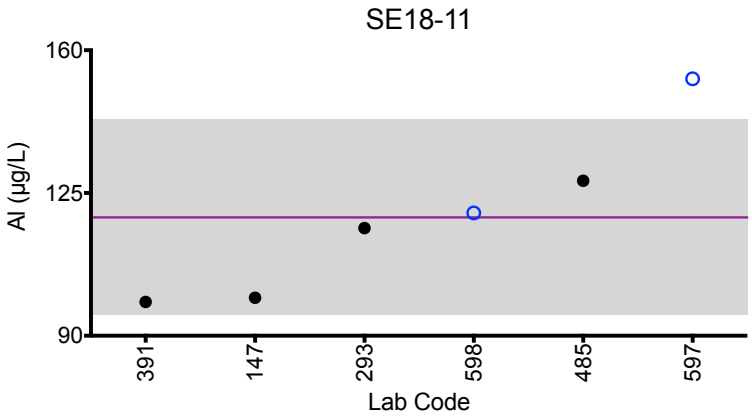
Results for Event #3, 2018:
Performance of Participating Laboratories

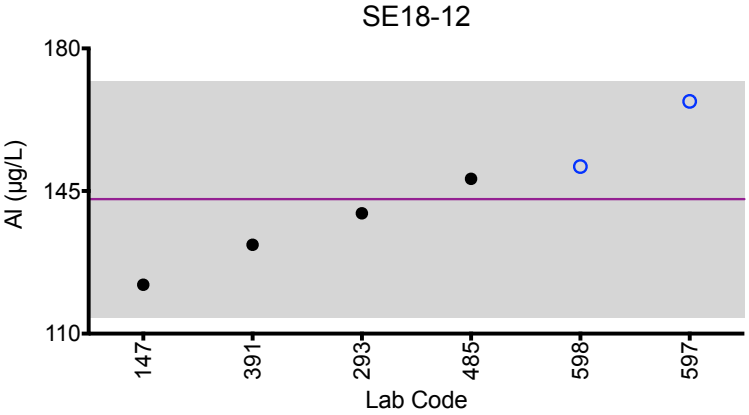
		Serum Al (µg/L)				
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
	Target	**119**	**143**	**75**	**200**	**42**
147	ETAAS-Z	99.3	122	71.5	165	37.5
293	DRC/CC-ICP-MS	116.40	139.52	72.31	203.49	40.86
391	ETAAS-Z	98.28	131.8	57.64 ↓	208.4	24.25 ↓
485	HR-ICP-MS	128	148	70.8	191	41.7
597	DRC/CC-ICP-MS	153 ↑	167	90	214	58 ↑
598	ICP-MS	120.1	151.0	86.1	219.6	48.0

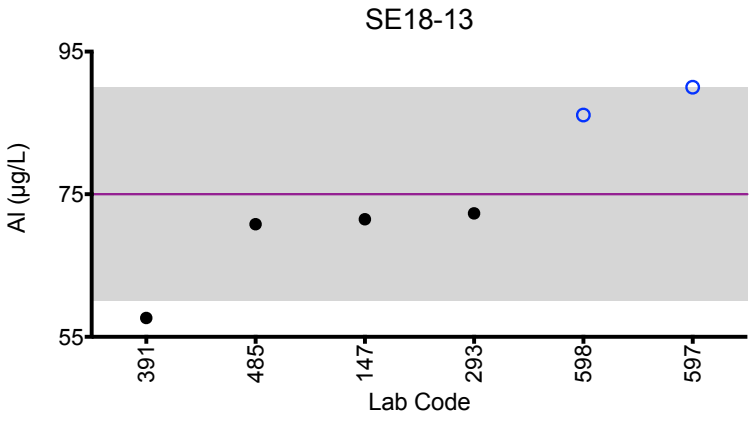
Based on the grading criteria for Al in Serum, 87% of results were satisfactory, with 2 of the 6 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

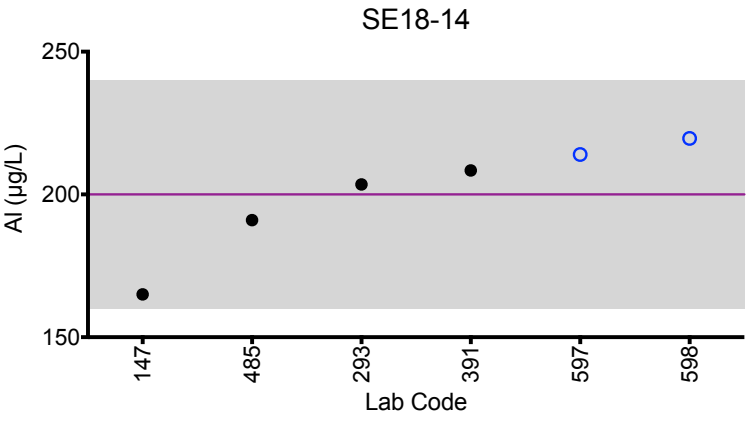
Results for Event #3, 2018: Summary Figures

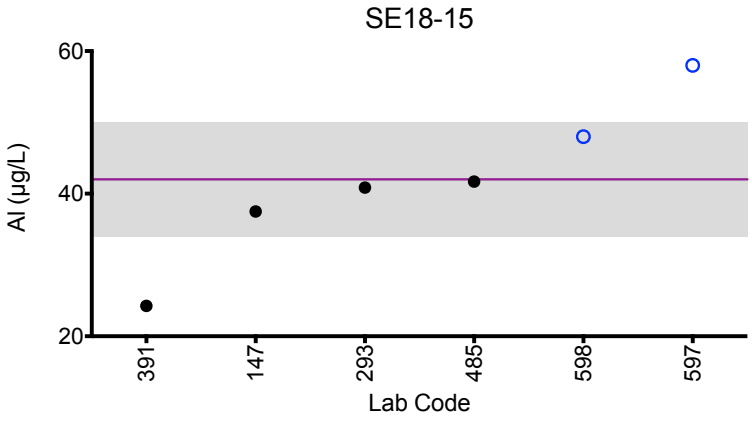
Serum Al











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

Serum Co (µg/L)					
	SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Target (Arithmetic Mean ($\bar{x}$))	1.00	6.7	16.2	3.94	3.46
Upper Limit	2.50	8.2	18.6	5.44	4.96
Lower Limit	0.00	5.2	13.8	2.44	1.96
Arithmetic SD (s)	0.05	0.5	1.0	0.19	0.27
Arithmetic RSD (%)	5.0	7.5	6.2	4.8	7.8
Number of Sample Measurements (N)	6	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

Results for Event #3, 2018:
Performance of Participating Laboratories

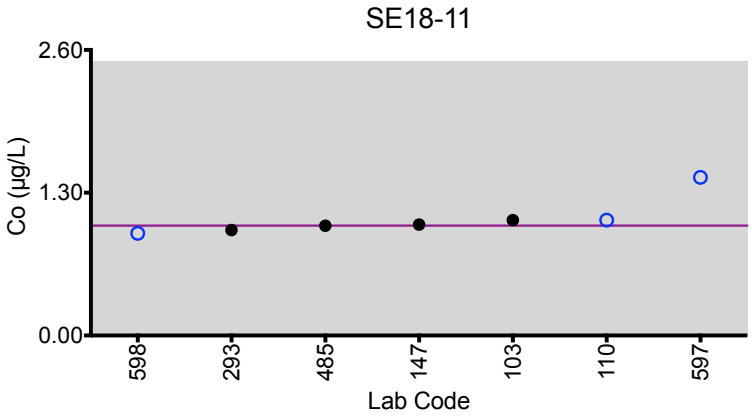
Serum Co (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
	Target	**1.00**	**6.7**	**16.2**	**3.94**	**3.46**
103	DRC/CC-ICP-MS	1.05	6.96	17.6	4.04	3.53
110	ICP-MS	1.05	7.06	17.1	4.02	3.49
147	ICP-MS	1.01	6.60	16.1	3.84	3.46
293	DRC/CC-ICP-MS	0.96	6.42	15.84	3.74	3.37
485	HR-ICP-MS	1.00	6.76	15.2	4.16	3.46
597	DRC/CC-ICP-MS	*1.44	7.51	17.0	4.13	3.92
598	ICP-MS	0.93	5.93	14.77	3.68	2.99

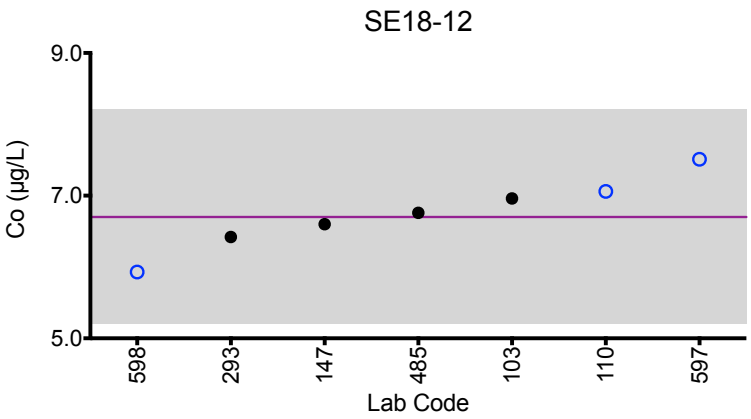
Based on the grading criteria for Co in Serum, 100% of results were satisfactory, with 0 of the 7 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

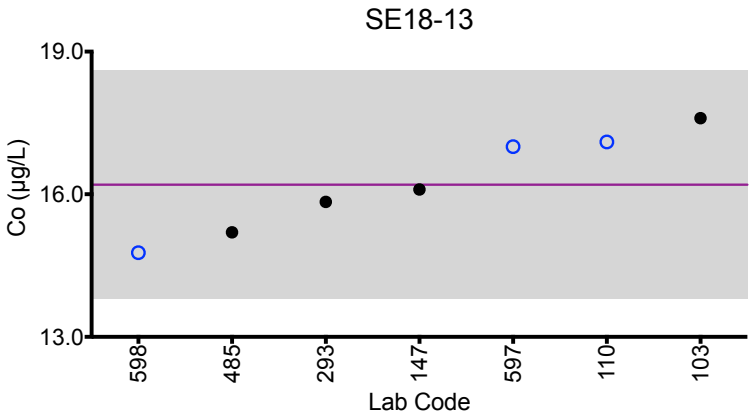
NEW YORK STATE | Department of Health | Wadsworth Center

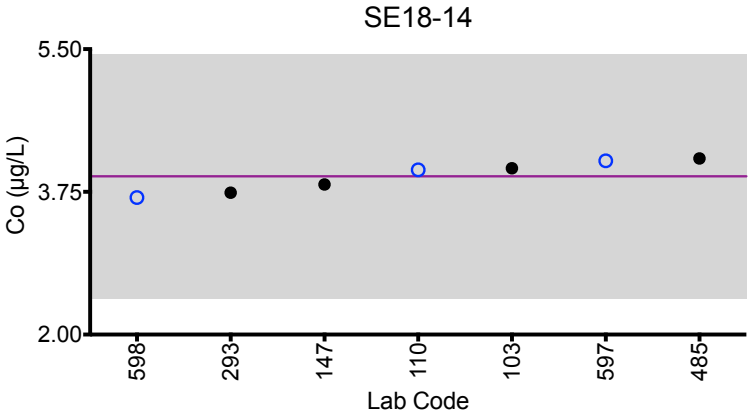
Results for Event #3, 2018: Summary Figures

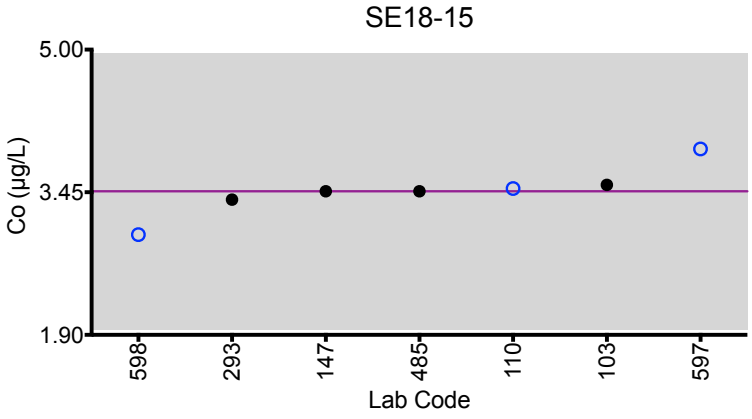
Serum Co











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

	Serum Cr (µg/L)				
	SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Target (Arithmetic Mean ($\bar{x}$))	8.7	3.0	1.70	4.8	6.75
Upper Limit	10.7	5.0	3.70	6.8	8.75
Lower Limit	6.7	1.0	0.00	2.8	4.75
Arithmetic SD (s)	1.1	0.5	0.18	0.6	0.26
Arithmetic RSD (%)	13	17	11	13	3.9
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

NEW YORK STATE | Department of Health | Wadsworth Center

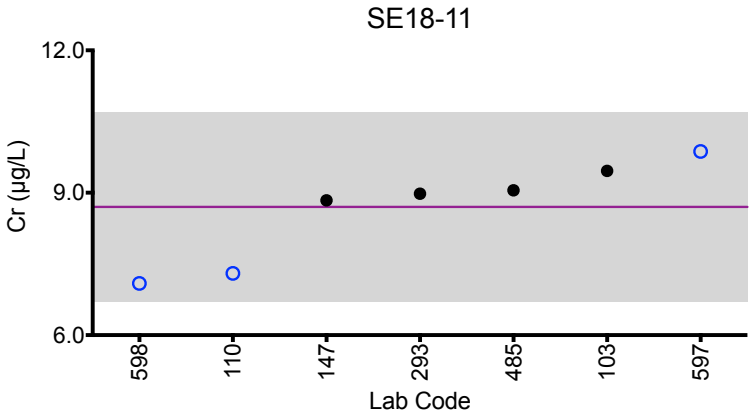
Results for Event #3, 2018:
Performance of Participating Laboratories

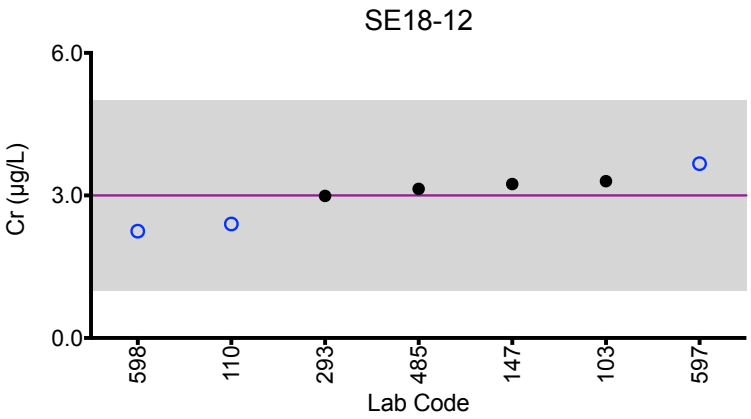
		Serum Cr (µg/L)				
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
	Target	**8.7**	**3.0**	**1.70**	**4.8**	**6.75**
103	DRC/CC-ICP-MS	9.46	3.30	1.96	5.21	7.05
110	DRC/CC-ICP-MS	7.3	2.4	1.7	4.5	6.4
147	DRC/CC-ICP-MS	8.84	3.24	1.67	4.51	6.66
293	DRC/CC-ICP-MS	8.98	2.99	1.8	4.98	6.7
485	HR-ICP-MS	9.05	3.14	1.65	5.02	7.08
597	DRC/CC-ICP-MS	9.87	3.67	1.79	5.33	6.63
598	DRC/CC-ICP-MS	7.09	2.25	1.36	3.73	*5.17

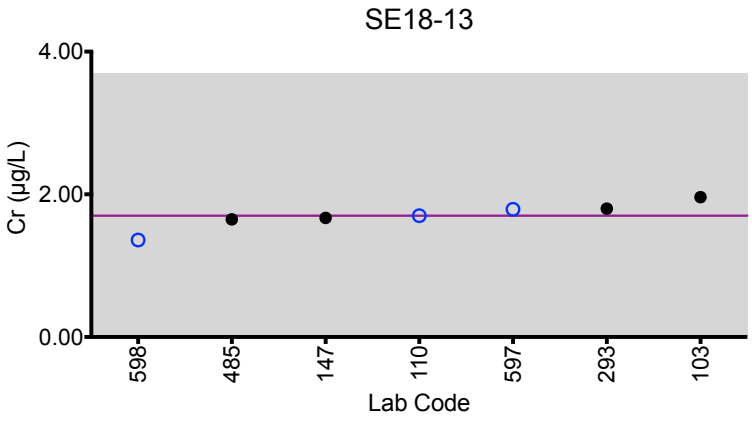
Based on the grading criteria for Cr in Serum, 100% of results were satisfactory, with 0 of the 7 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

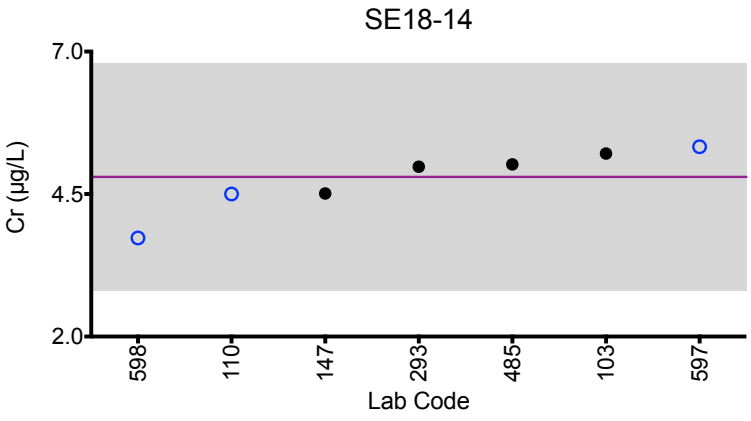
Results for Event #3, 2018: Summary Figures

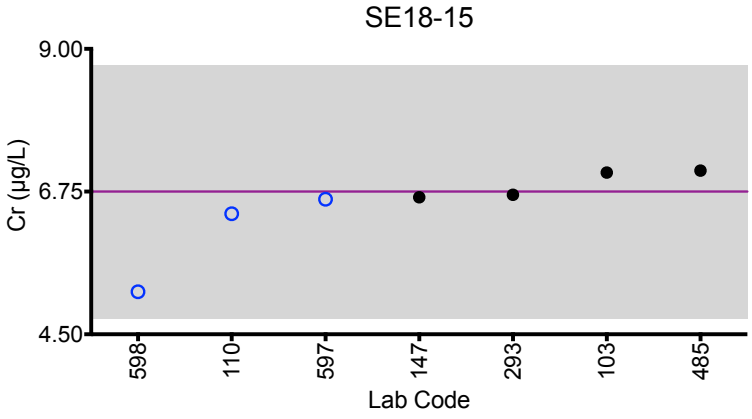
Serum Cr











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

	Serum Cu (µg/L)				
	SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Target (Arithmetic Mean ($\bar{x}$))	1530	1990	1030	2750	1790
Upper Limit	1760	2290	1180	3160	2060
Lower Limit	1300	1690	880	2340	1520
Arithmetic SD (s)	90	150	70	160	130
Arithmetic RSD (%)	5.9	7.5	6.8	5.8	7.3
Number of Sample Measurements (N)	8	8	8	8	8

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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Performance of Participating Laboratories

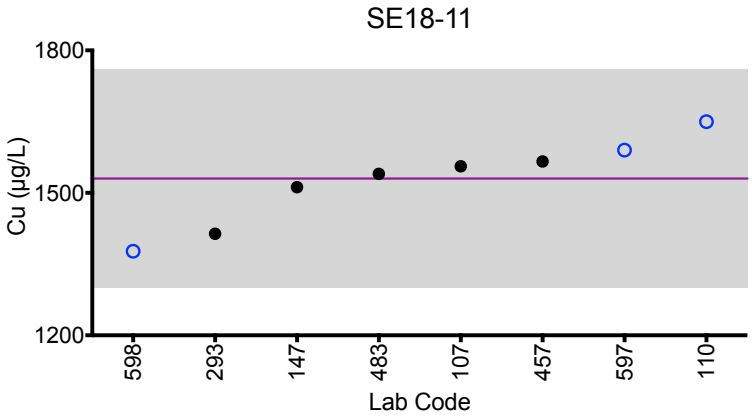
Serum Cu (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
	Target	**1530**	**1990**	**1030**	**2750**	**1790**
107	DRC/CC-ICP-MS	1556	2012	1038	2822	1794
110	ICP-MS	1650	2120	1110	2870	1910
147	ICP-MS	1512	1950	1010	2783	1830
293	DRC/CC-ICP-MS	1413.86	1820.72	959.95	2623.65	1650.99
457	ICP-AES/OES	1566	1984	1048	2589	1805
483	DRC/CC-ICP-MS	1540	2100	1100	2970	1890
597	DRC/CC-ICP-MS	1590	2170	1070	2860	1900
598	ICP-MS	1377	1743	923	2494	1535

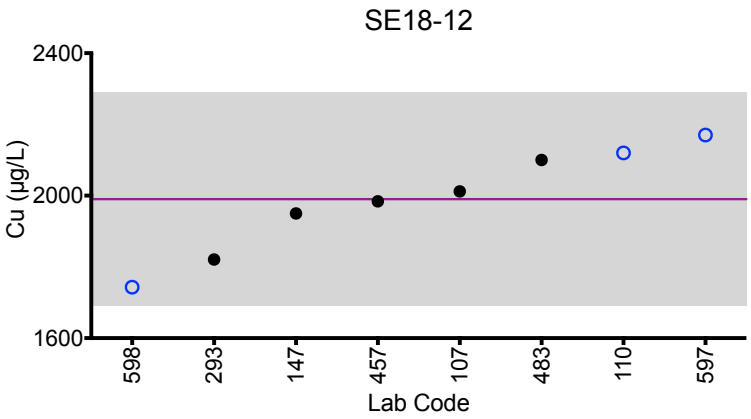
Based on the grading criteria for Cu in Serum, 100% of results were satisfactory, with 0 of the 8 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

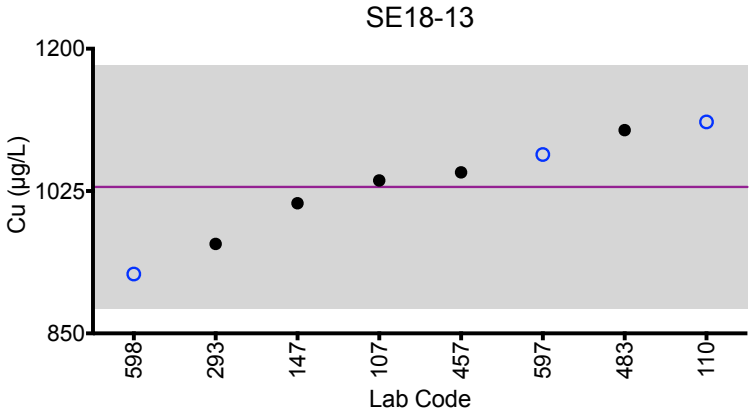
NEW YORK STATE | Department of Health | Wadsworth Center

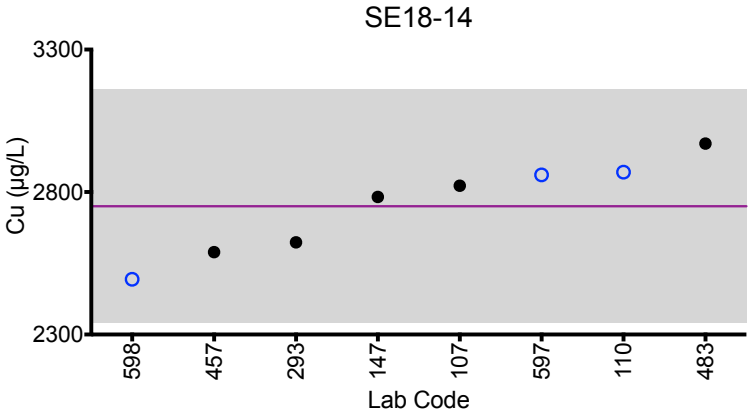
Results for Event #3, 2018: Summary Figures

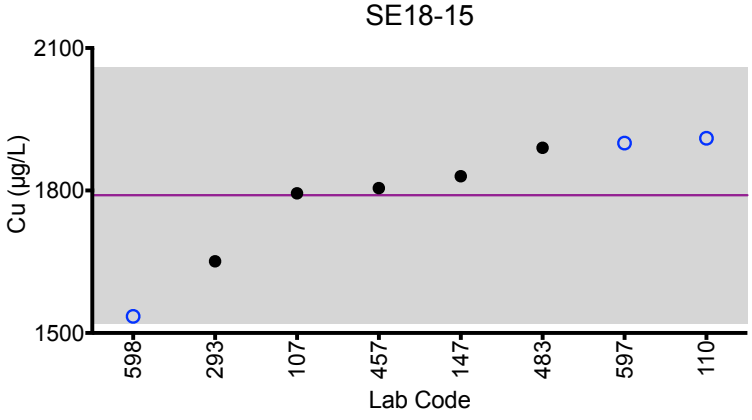
Serum Cu











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

	Serum Se (µg/L)				
	SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Target (Arithmetic Mean ($\bar{x}$))	241	116	85	176	141
Upper Limit	289	139	102	211	169
Lower Limit	193	93	68	141	113
Arithmetic SD (s)	24	14	11	17	14
Arithmetic RSD (%)	10	12	13	9.7	9.9
Number of Sample Measurements (N)	8	8	8	8	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 by New York State Department of Health's Wadsworth Center, the PT Program organizer.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Performance of Participating Laboratories

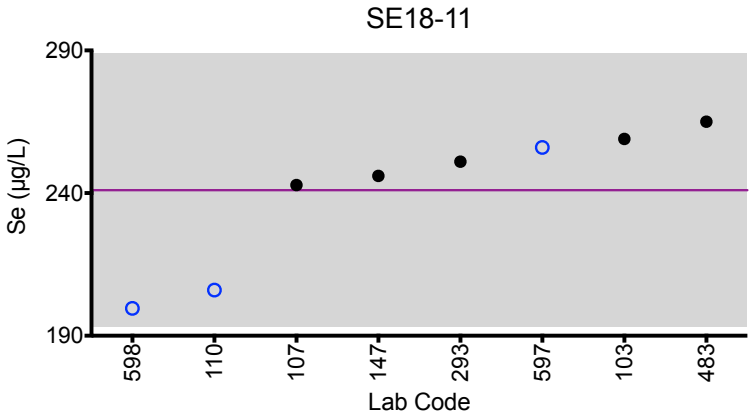
		Serum Se (µg/L)				
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
	Target	**241**	**116**	**85**	**176**	**141**
103	DRC/CC-ICP-MS	259	125	90.2	190	149
107	DRC/CC-ICP-MS	242.8	110.5	76.8	172.7	132.5
110	DRC/CC-ICP-MS	206	101	75	164	133
147	ICP-MS	246	116	88.5	179	148
293	DRC/CC-ICP-MS	250.99	115.23	83.66	177.58	135.75
483	DRC/CC-ICP-MS	265	134	101	201	162
597	DRC/CC-ICP-MS	256	130	95	182	150
598	DRC/CC-ICP-MS	199.6	93.3	69.2	145.2	116.2

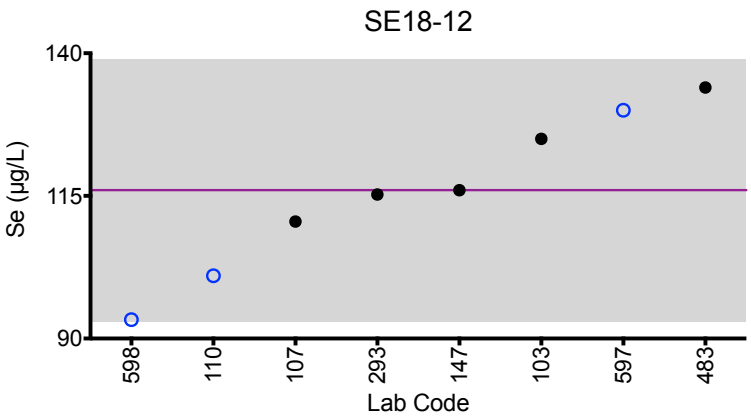
Based on the grading criteria for Se in Serum, 100% of results were satisfactory, with 0 of the 8 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

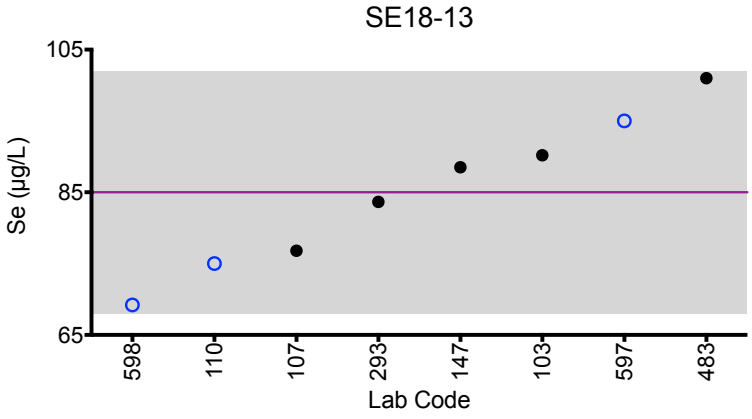
NEW YORK STATE | Department of Health | Wadsworth Center

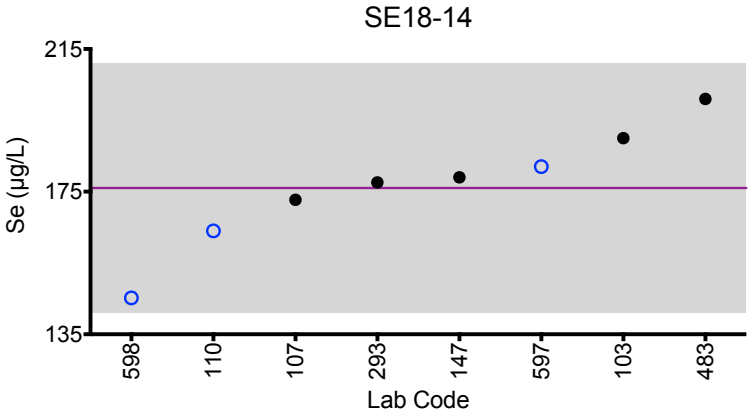
Results for Event #3, 2018: Summary Figures

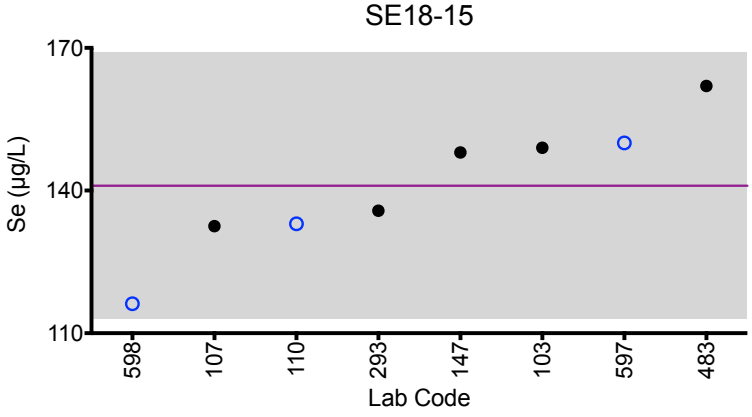
Serum Se











Legend:

o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Summary Statistics

	Serum Zn (µg/L)				
	SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Target (Arithmetic Mean ($\bar{x}$))	560	2890	1880	807	2740
Upper Limit	640	3320	2160	928	3150
Lower Limit	480	2460	1600	686	2330
Arithmetic SD (s)	80	230	110	30	120
Arithmetic RSD (%)	14	8.0	5.9	3.7	4.4
Number of Sample Measurements (N)	8	8	8	7	7

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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Performance of Participating Laboratories

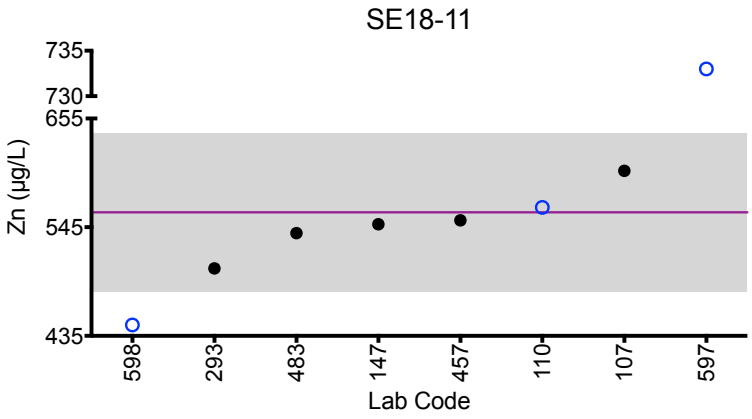
Serum Zn (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
	Target	**560**	**2890**	**1880**	**807**	**2740**
107	DRC/CC-ICP-MS	602	2901	1888	826	2594
110	ICP-MS	565	3160	2020	839	2850
147	ICP-MS	548	2895	1889	810	2830
293	DRC/CC-ICP-MS	503.27	2735.95	1816.99	750.33	2545.1
457	ICP-AES/OES	552	2907	1884	786	2796
483	DRC/CC-ICP-MS	539	2960	1970	817	2720
597	DRC/CC-ICP-MS	733 ↑	3150	1950	823	2830
598	ICP-MS	446 ↓	2442 ↓	1649	*675 ↓	*2134 ↓

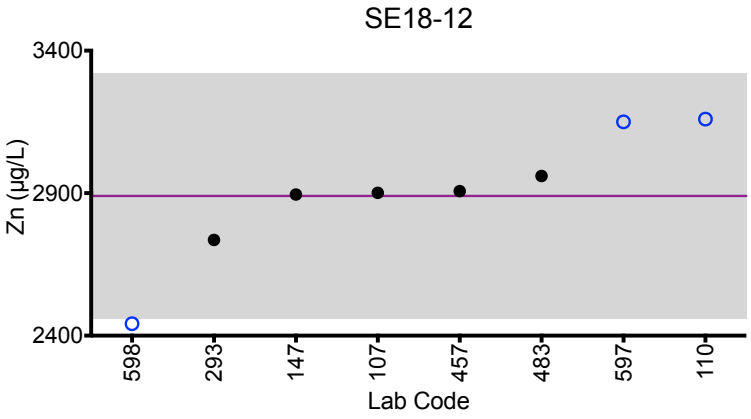
Based on the grading criteria for Zn in Serum, 88% of results were satisfactory, with 1 of the 8 laboratories reporting 2 or more of the 5 results outside of the acceptable ranges.

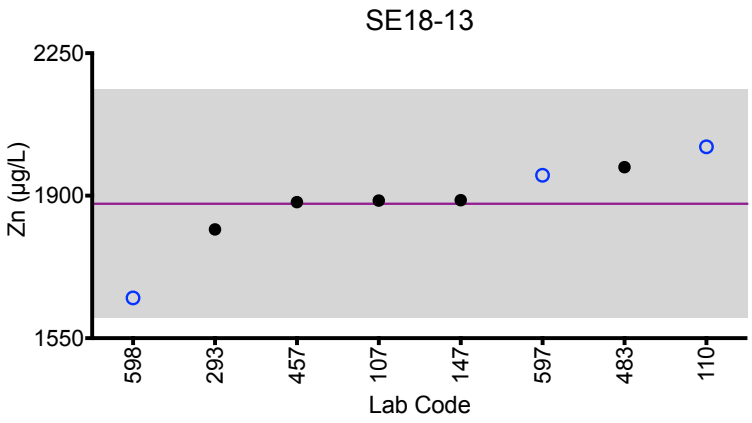
NEW YORK STATE | Department of Health | Wadsworth Center

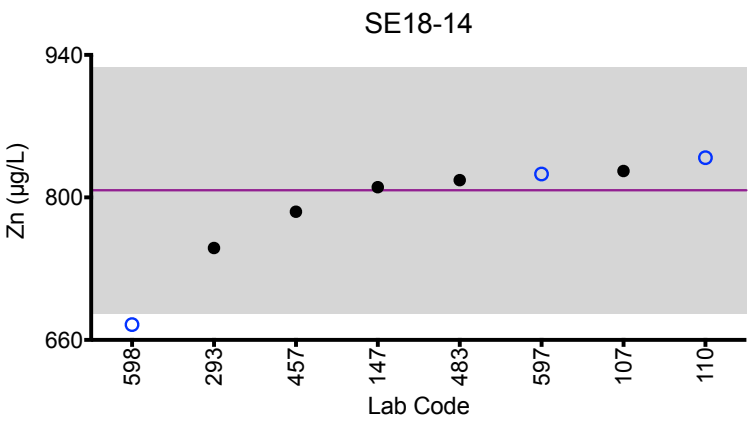
Results for Event #3, 2018: Summary Figures

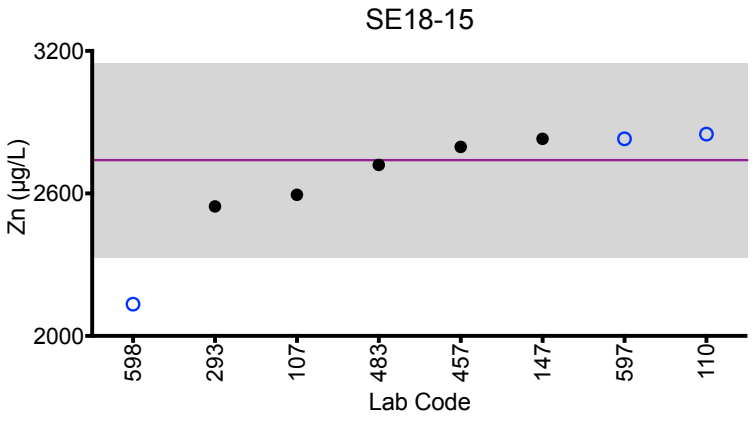
Serum Zn











Legend:

o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

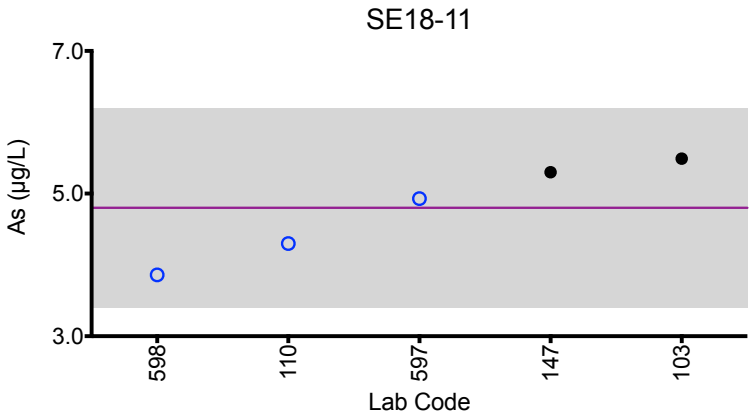
Serum As (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
103	DRC/CC-ICP-MS	5.49	13.3	9.59	21.0	0.960
110	DRC/CC-ICP-MS	4.3	10.1	7.5	17.7	1.2
147	ICP-MS	5.30	13.6	9.14	21.9	<1.57
597	DRC/CC-ICP-MS	4.93	11.8	8.03	17.2	1.12
598	DRC/CC-ICP-MS	3.86	9.19	6.78	13.98	0.73
Summary Statistics						
		SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Arithmetic Mean ($\bar{x}$)		4.8	11.6	8.2	18.4	1.00
Arithmetic SD (s)		0.7	1.9	1.2	3.2	0.21
Arithmetic RSD (%)		15	16	15	17	21
Number of Sample Measurements (N)		5	5	5	5	4

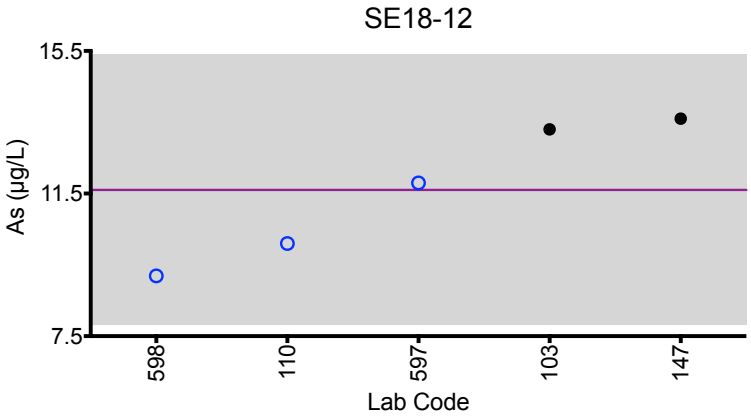
*Denotes a statistical Outlier.

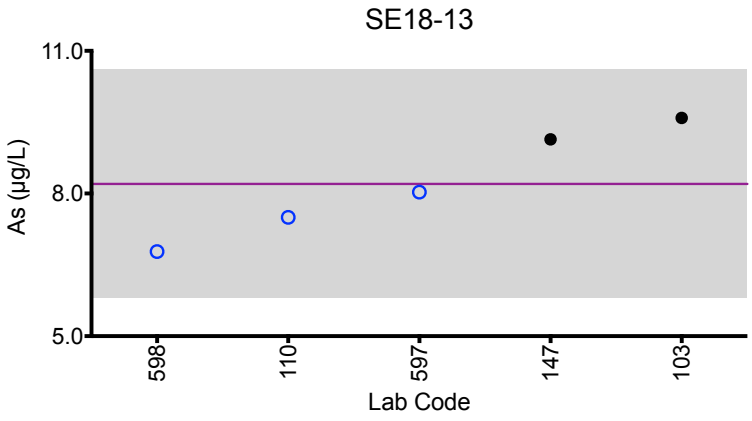
NEW YORK STATE | Department of Health | Wadsworth Center

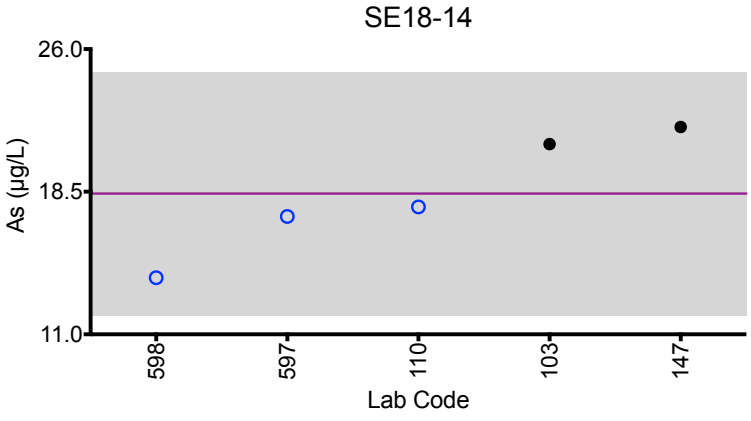
Results for Event #3, 2018: Summary Figures

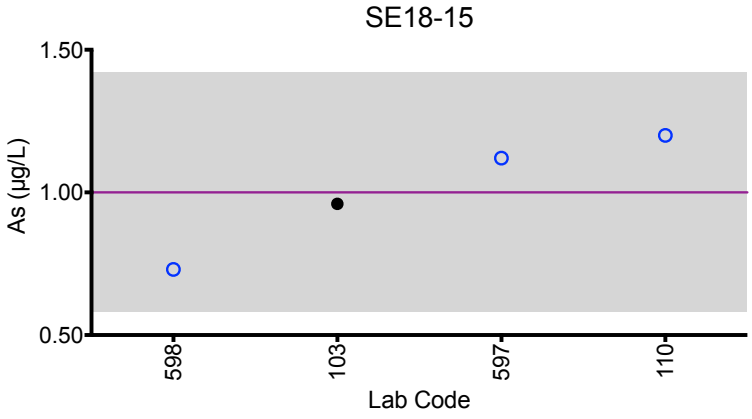
Serum As











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

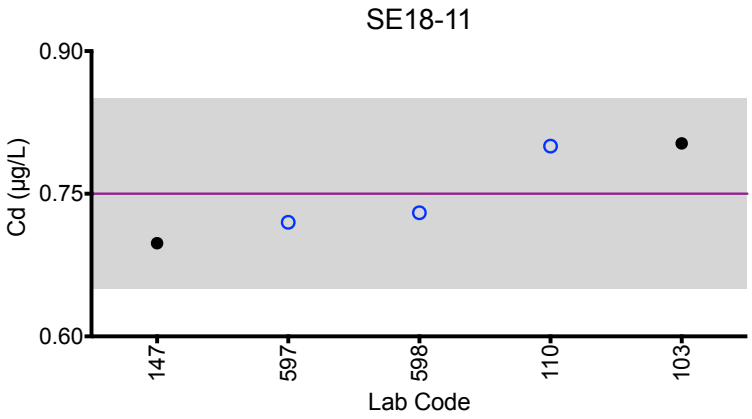
Serum Cd (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
103	DRC/CC-ICP-MS	0.803	5.75	1.15	4.06	1.96
110	ICP-MS	0.8	5.6	1.2	3.9	1.9
147	ICP-MS	0.698	4.96	1.04	3.56	1.99
597	DRC/CC-ICP-MS	0.72	6.08	1.25	4.05	2.01
598	DRC/CC-ICP-MS	0.73	4.66	1.01	3.23	*1.57
Summary Statistics						
		SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Arithmetic Mean ($\bar{x}$)		0.75	5.4	1.13	3.8	1.97
Arithmetic SD (s)		0.05	0.6	0.10	0.4	0.05
Arithmetic RSD (%)		6.7	11	8.8	11	2.5
Number of Sample Measurements (N)		5	5	5	5	4

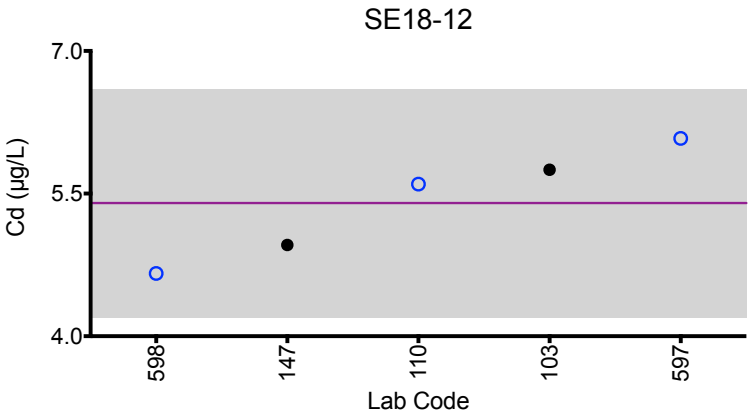
*Denotes a statistical Outlier.

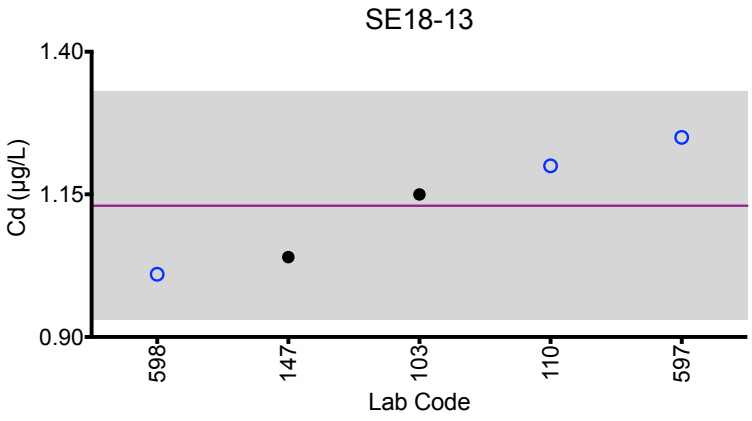
NEW YORK STATE | Department of Health | Wadsworth Center

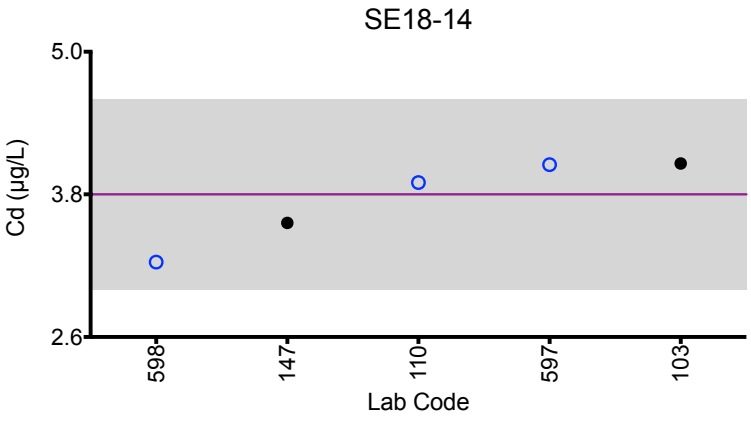
Results for Event #3, 2018: Summary Figures

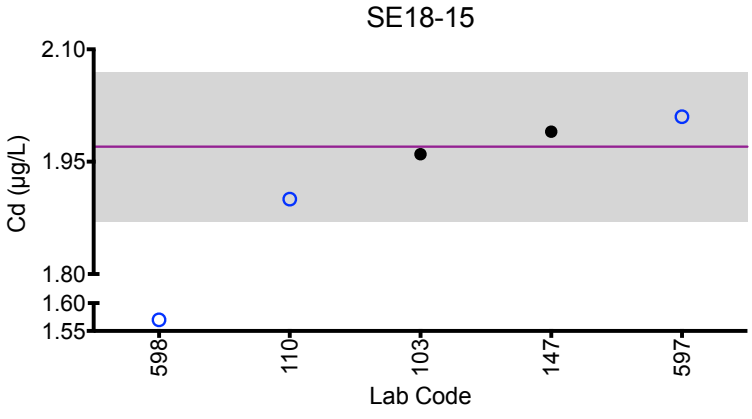
Serum Cd











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

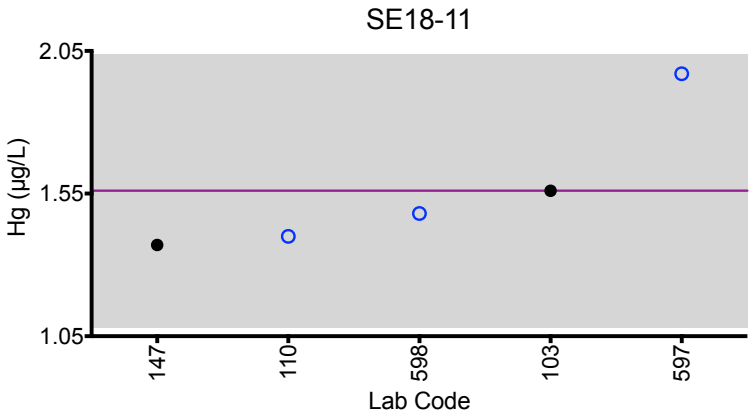
Serum Hg (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
103	DRC/CC-ICP-MS	1.56	3.42	3.29	7.05	0.853
110	ICP-MS	1.4	3.5	3.4	6.9	0.9
147	ICP-MS	1.37	3.27	3.21	6.30	0.832
597	DMA	1.97	4.01	3.91	7.94	1.08
598	ICP-MS	1.48	3.15	3.08	6.41	0.72
Summary Statistics						
		SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Arithmetic Mean ($\bar{x}$)		1.56	3.47	3.38	6.9	0.88
Arithmetic SD (s)		0.24	0.33	0.32	0.7	0.13
Arithmetic RSD (%)		15	9.5	9.5	10	15
Number of Sample Measurements (N)		5	5	5	5	5

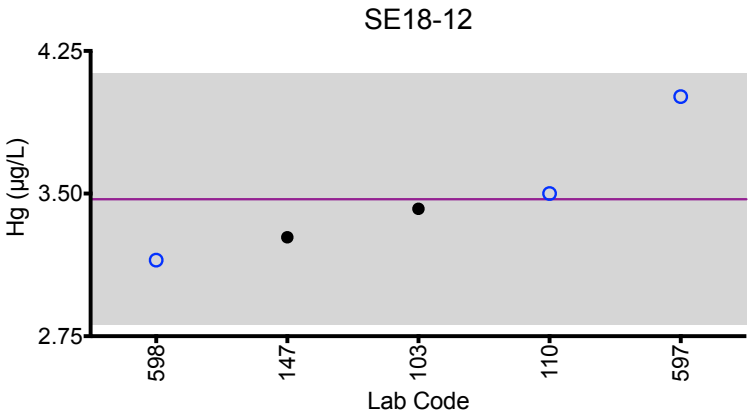
*Denotes a statistical Outlier.

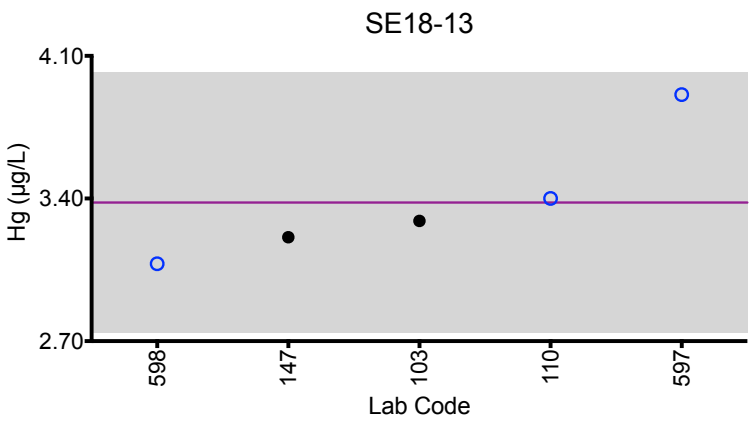
NEW YORK STATE | Department of Health | Wadsworth Center

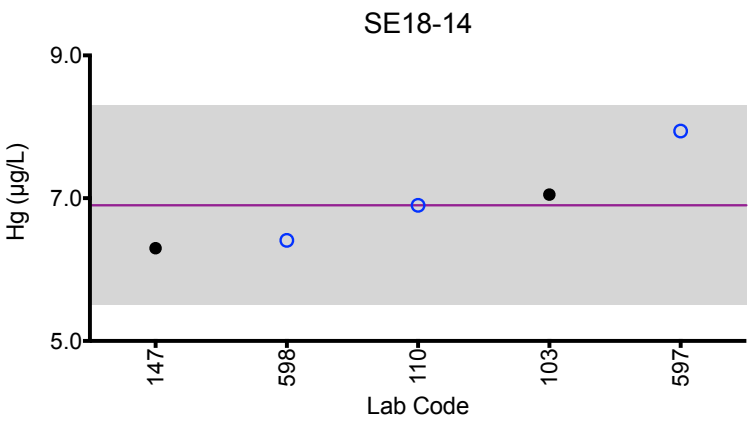
Results for Event #3, 2018: Summary Figures

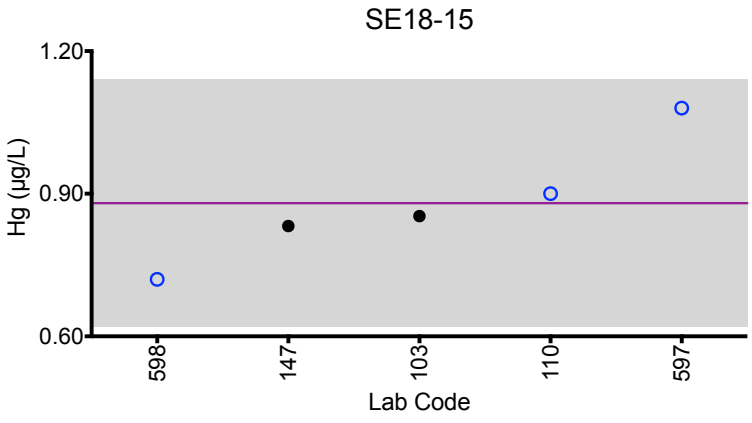
Serum Hg











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

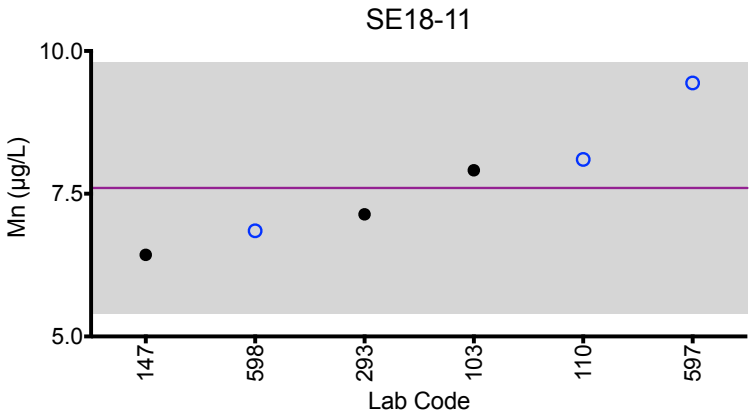
Serum Mn (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
103	DRC/CC-ICP-MS	7.91	3.64	7.02	3.00	11.0
110	ICP-MS	8.1	3.8	7.0	3.2	11.1
147	ICP-MS	6.43	3.45	5.49	2.51	9.78
293	DRC/CC-ICP-MS	7.14	3.69	6.87	2.65	10.05
597	DRC/CC-ICP-MS	9.44	4.41	7.08	3.38	11.1
598	ICP-MS	6.85	3.24	6.08	2.59	9.23
Summary Statistics						
		SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Arithmetic Mean ($\bar{x}$)		7.6	3.7	6.6	2.89	10.4
Arithmetic SD (s)		1.1	0.4	0.7	0.36	0.8
Arithmetic RSD (%)		14	11	11	12	7.7
Number of Sample Measurements (N)		6	6	6	6	6

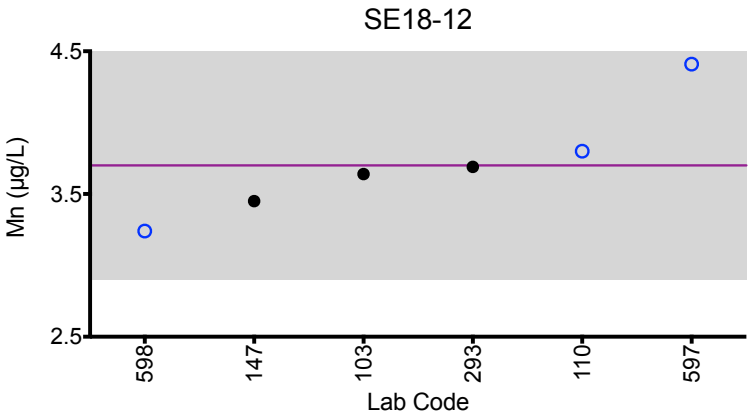
*Denotes a statistical Outlier.

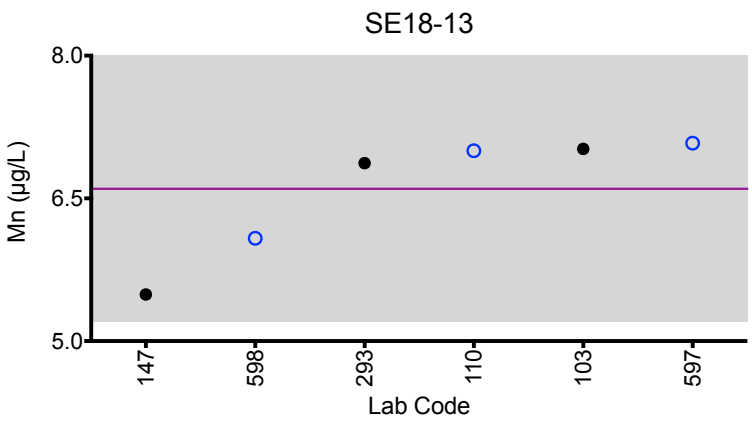
NEW YORK STATE | Department of Health | Wadsworth Center

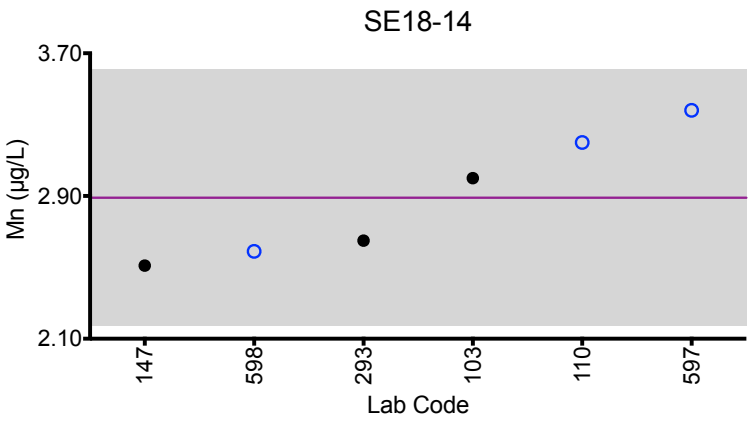
Results for Event #3, 2018: Summary Figures

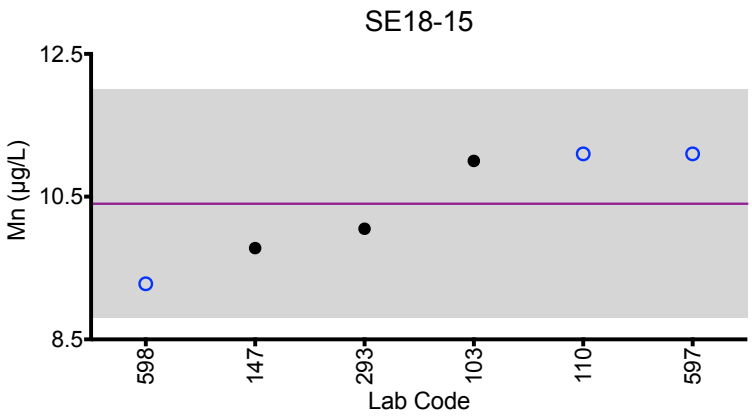
Serum Mn











Legend:
o CHEAR 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.

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Serum Mo (µg/L)

Lab Code	Method	SE18-11	SE18-12	SE18-13	SE18-14	SE18-15
103	DRC/CC-ICP-MS	2.78	4.80	4.24	8.49	7.30
110	ICP-MS	2.9	4.9	4.1	8.1	7.2
147	ICP-MS	2.31	4.32	3.98	6.74	6.81
293	DRC/CC-ICP-MS	2.77	4.68	4.16	8.2	6.9
485	HR-ICP-MS	3.15	4.80	4.74	8.78	7.50
597	DRC/CC-ICP-MS	2.63	4.56	3.99	7.45	6.92
598	DRC/CC-ICP-MS	2.33	3.77	3.50	6.66	6.01

Summary Statistics

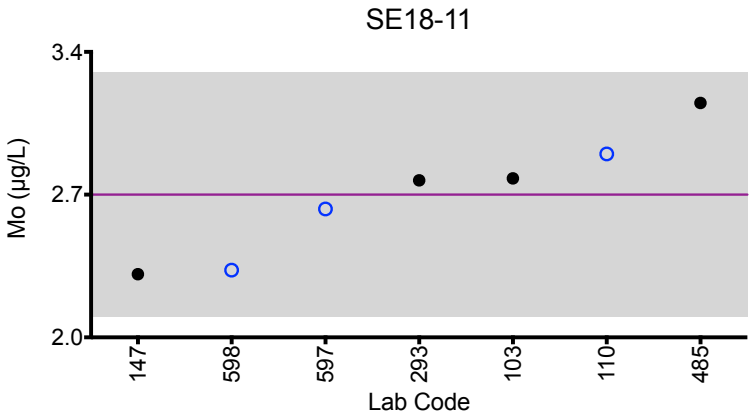
	SE18-11	SE18-12	SE18-13	SE18-14	SE18-15
Arithmetic Mean ($\bar{x}$)	2.7	4.55	4.10	7.8	6.9
Arithmetic SD (s)	0.3	0.39	0.37	0.8	0.5
Arithmetic RSD (%)	11	8.6	9.0	10	7.2
Number of Sample Measurements (N)	7	7	7	7	7

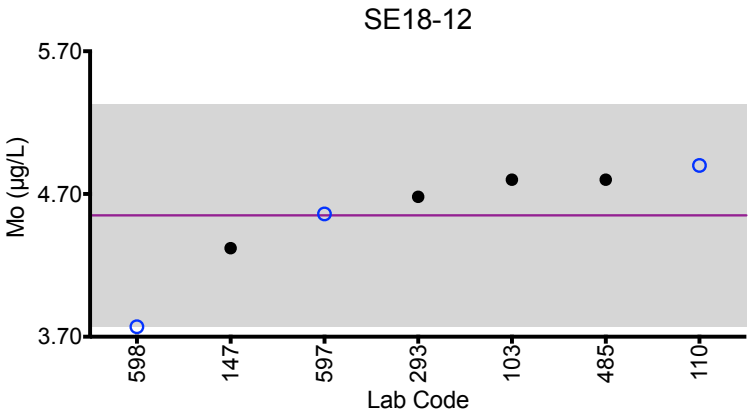
*Denotes a statistical Outlier.

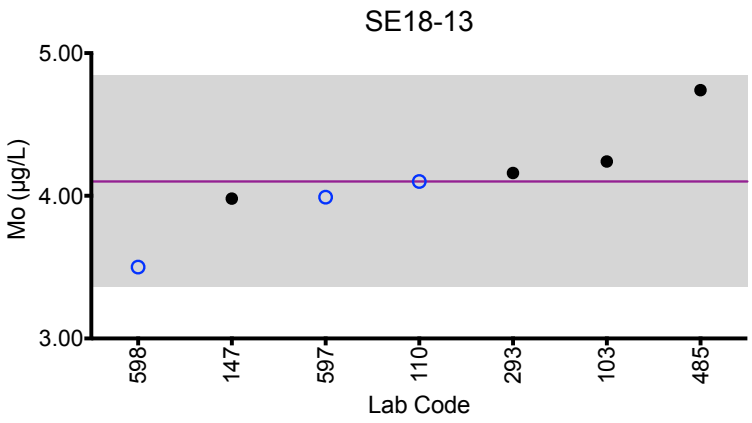
NEW YORK STATE | Department of Health | Wadsworth Center

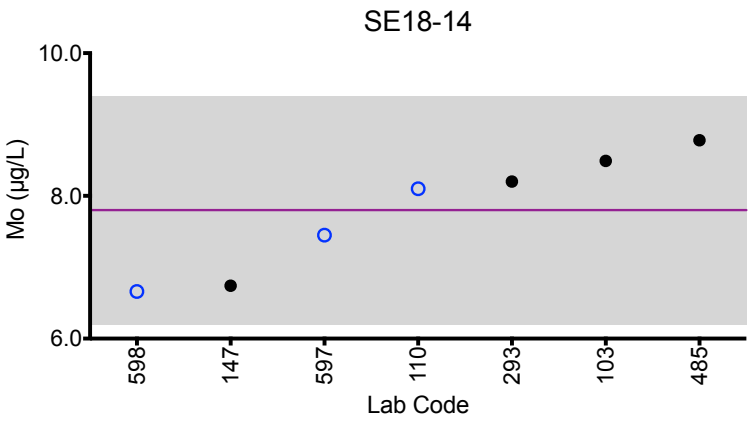
Results for Event #3, 2018: Summary Figures

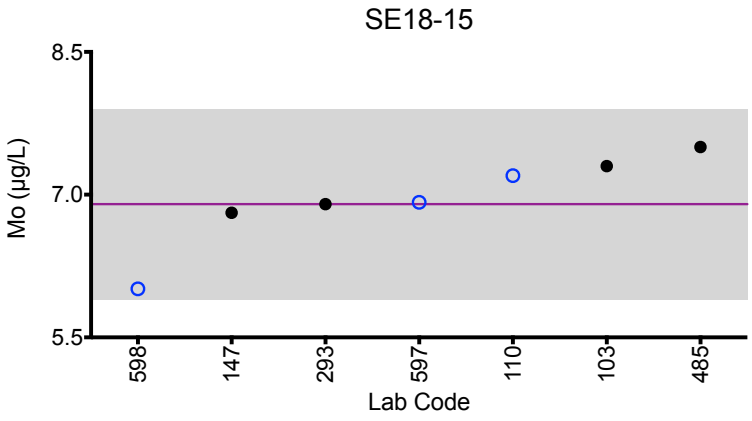
Serum Mo











Legend:
o CHEAR 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.

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Serum Ni (µg/L)

Lab Code	Method	SE18-11	SE18-12	SE18-13	SE18-14	SE18-15
110	DRC/CC-ICP-MS	5.9	1.8	4.2	9.3	6
147	ICP-MS	6.58	1.91	4.25	8.69	5.87
293	DRC/CC-ICP-MS	7.1	2.22	4.44	9.52	6.26
485	HR-ICP-MS	7.20	1.99	4.38	9.52	6.61
597	DRC/CC-ICP-MS	8.56	3.45	*5.35	10.5	7.35
598	ICP-MS	6.97	2.59	4.64	9.18	6.05

Summary Statistics

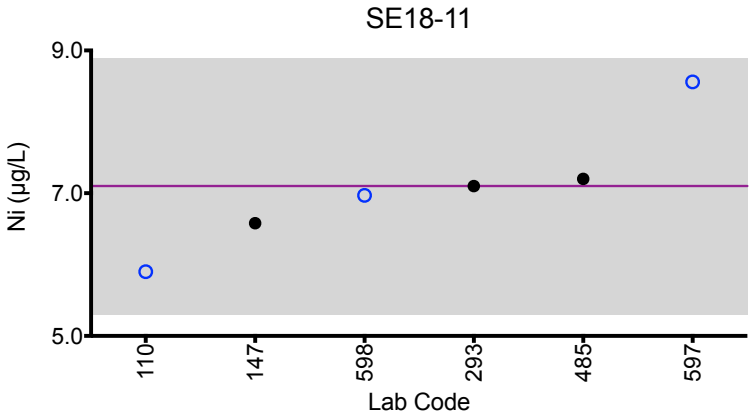
	SE18-11	SE18-12	SE18-13	SE18-14	SE18-15
Arithmetic Mean ($\bar{x}$)	7.1	2.3	4.38	9.5	6.4
Arithmetic SD (s)	0.9	0.6	0.17	0.6	0.6
Arithmetic RSD (%)	13	26	3.9	6.3	9.4
Number of Sample Measurements (N)	6	6	5	6	6

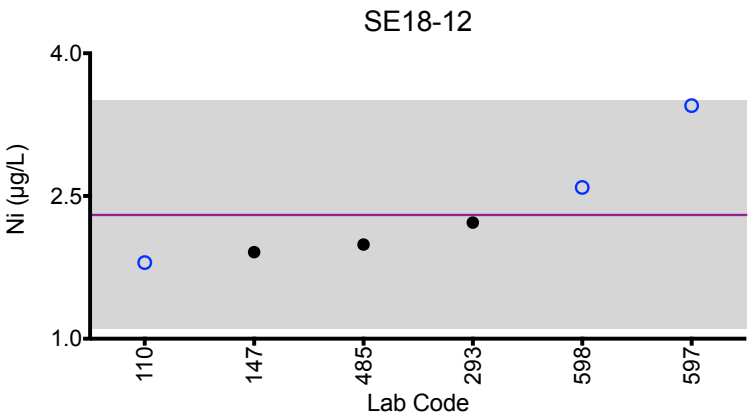
*Denotes a statistical Outlier.

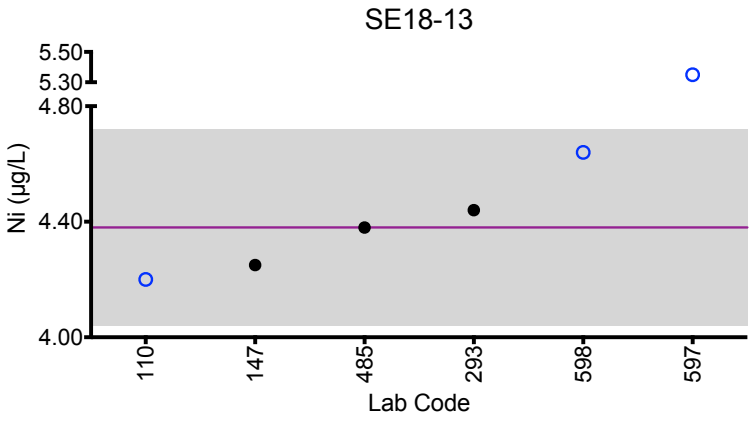
NEW YORK STATE | Department of Health | Wadsworth Center

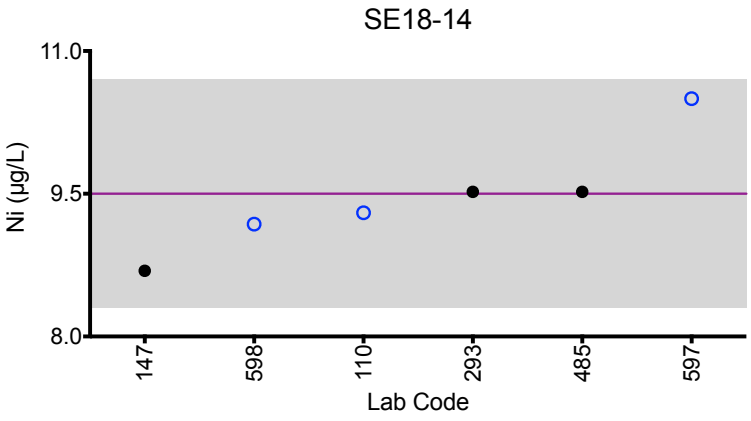
Results for Event #3, 2018: Summary Figures

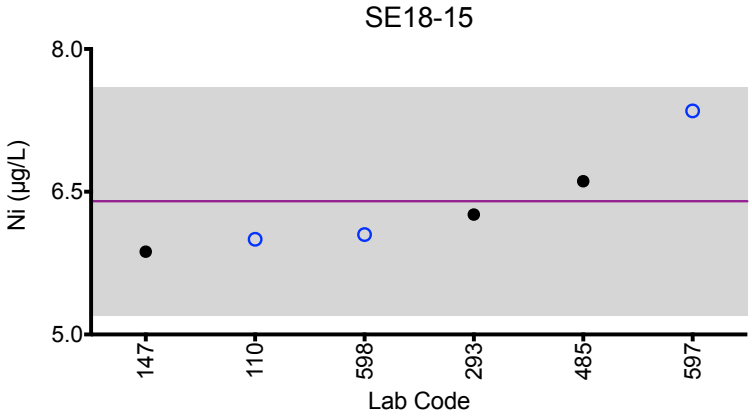
Serum Ni











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

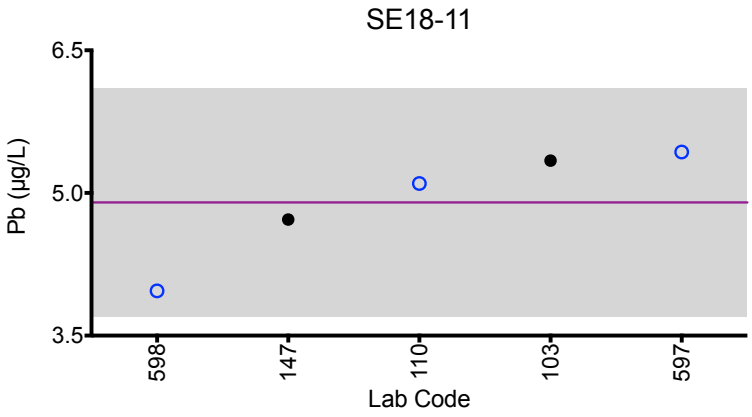
Serum Pb (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
103	DRC/CC-ICP-MS	5.34	1.99	9.78	3.55	6.94
110	ICP-MS	5.1	1.9	9.5	3.5	6.9
147	ICP-MS	4.72	1.85	9.82	3.13	6.22
597	DRC/CC-ICP-MS	5.43	2.16	9.80	3.46	6.86
598	ICP-MS	3.97	1.47	*7.43	2.64	4.99
Summary Statistics						
		SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Arithmetic Mean ($\bar{x}$)		4.9	1.87	9.72	3.3	6.4
Arithmetic SD (s)		0.6	0.25	0.15	0.4	0.8
Arithmetic RSD (%)		12	13	1.5	12	13
Number of Sample Measurements (N)		5	5	4	5	5

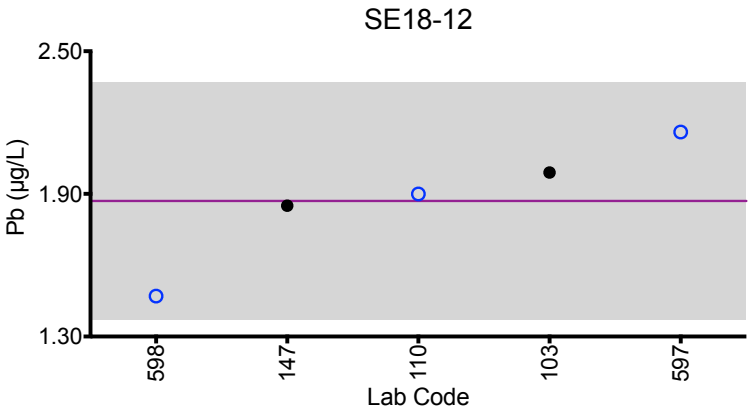
*Denotes a statistical Outlier.

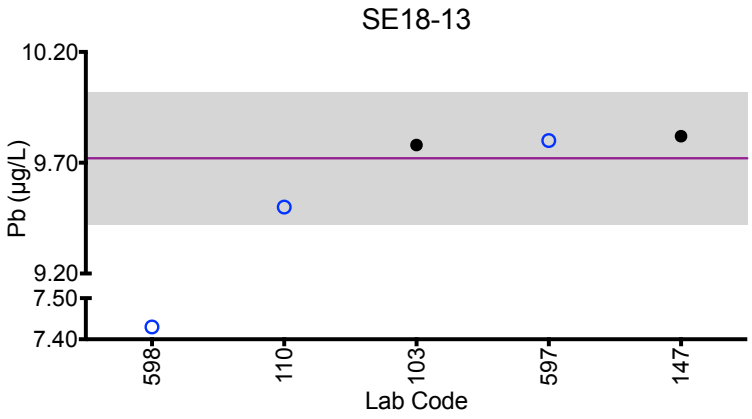
NEW YORK STATE | Department of Health | Wadsworth Center

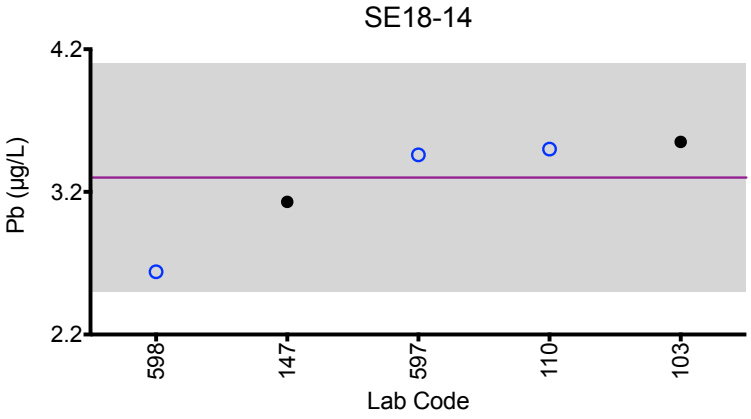
Results for Event #3, 2018: Summary Figures

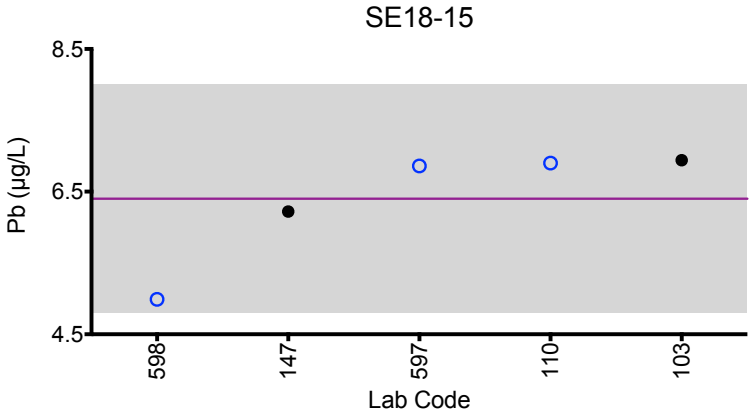
Serum Pb











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

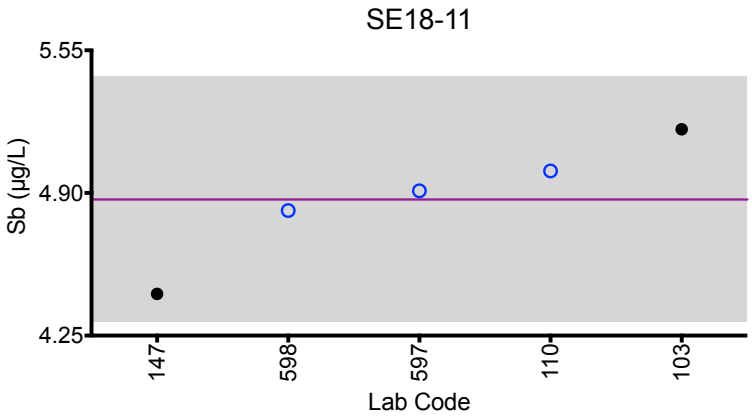
Serum Sb (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
103	DRC/CC-ICP-MS	5.19	0.973	1.37	3.98	1.20
110	ICP-MS	5.00	0.89	1.31	3.83	1.25
147	ICP-MS	4.44	0.927	1.29	3.42	1.11
597	DRC/CC-ICP-MS	4.91	1.06	1.34	3.50	1.15
598	ICP-MS	4.82	0.94	1.26	3.68	1.06
Summary Statistics						
		SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Arithmetic Mean ($\bar{x}$)		4.87	0.96	1.31	3.68	1.15
Arithmetic SD (s)		0.28	0.06	0.04	0.23	0.07
Arithmetic RSD (%)		5.7	6.3	3.1	6.3	6.1
Number of Sample Measurements (N)		5	5	5	5	5

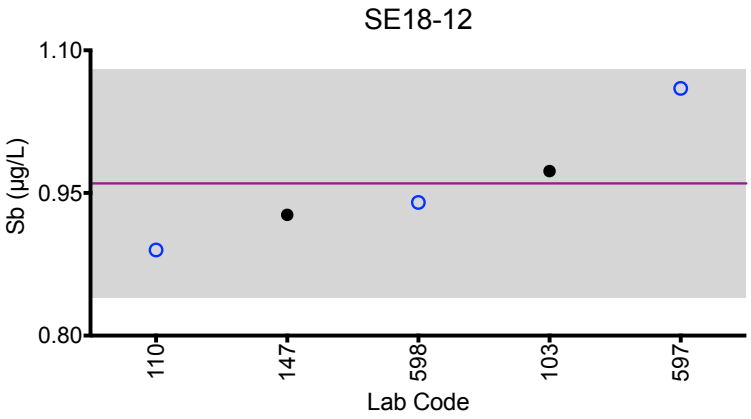
*Denotes a statistical Outlier.

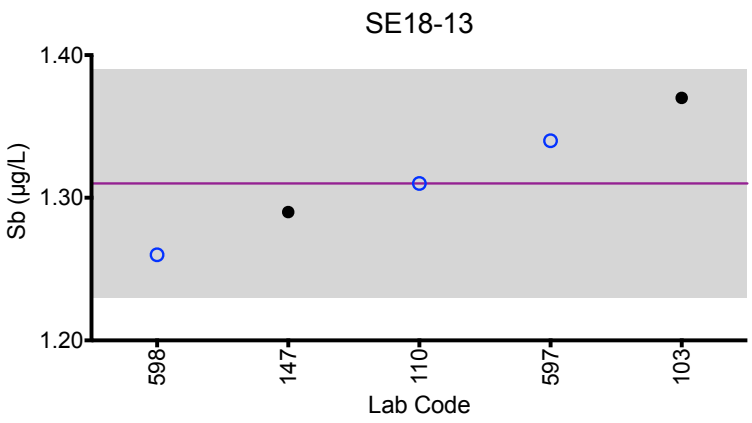
NEW YORK STATE | Department of Health | Wadsworth Center

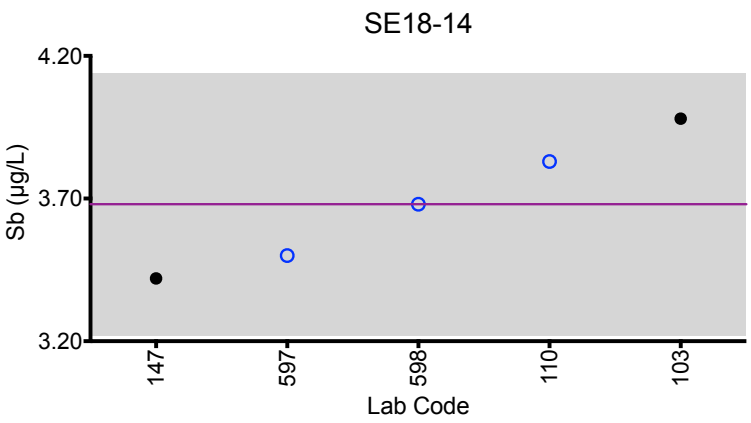
Results for Event #3, 2018: Summary Figures

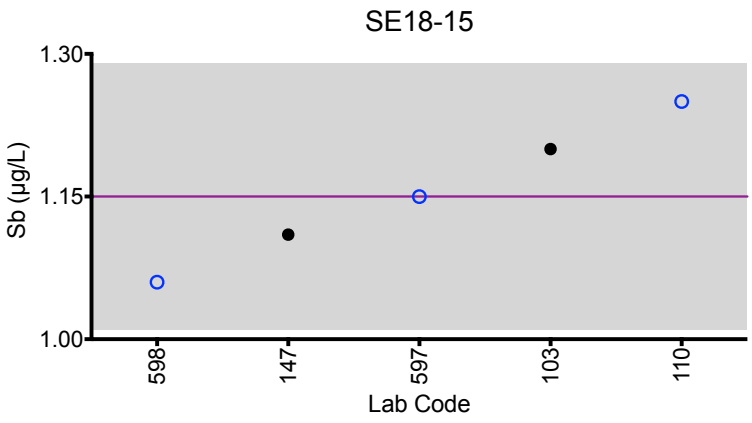
Serum Sb











Legend:
o CHEAR 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.

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Serum V (µg/L)

Lab Code	Method	SE18-11	SE18-12	SE18-13	SE18-14	SE18-15
110	DRC/CC-ICP-MS	0.8	6.5	3.3	5.0	8.6
147	DRC/CC-ICP-MS	0.658	6.02	2.55	3.92	6.94
293	DRC/CC-ICP-MS	1.1	7.54	3.22	4.94	8.54
485	HR-ICP-MS	0.735	7.20	3.07	4.67	8.37
597	DRC/CC-ICP-MS	0.989	6.77	3.03	4.35	7.87
598	DRC/CC-ICP-MS	0.82	5.87	2.69	4.03	6.86

Summary Statistics

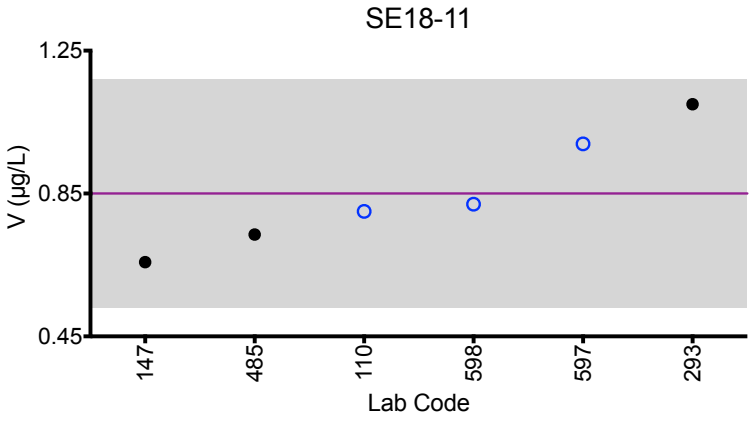
	SE18-11	SE18-12	SE18-13	SE18-14	SE18-15
Arithmetic Mean ($\bar{x}$)	0.85	6.7	2.98	4.5	7.9
Arithmetic SD (s)	0.16	0.7	0.30	0.5	0.8
Arithmetic RSD (%)	19	10	10	11	10
Number of Sample Measurements (N)	6	6	6	6	6

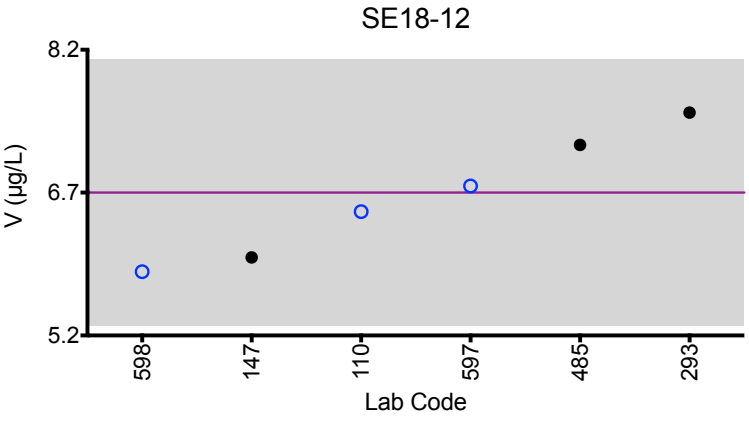
*Denotes a statistical Outlier.

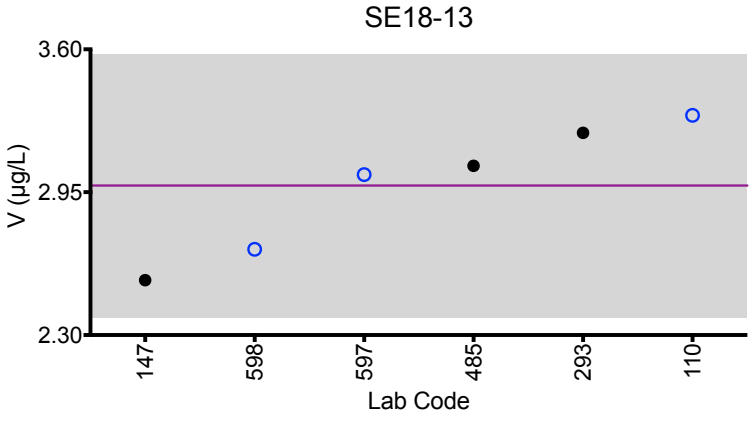
NEW YORK STATE | Department of Health | Wadsworth Center

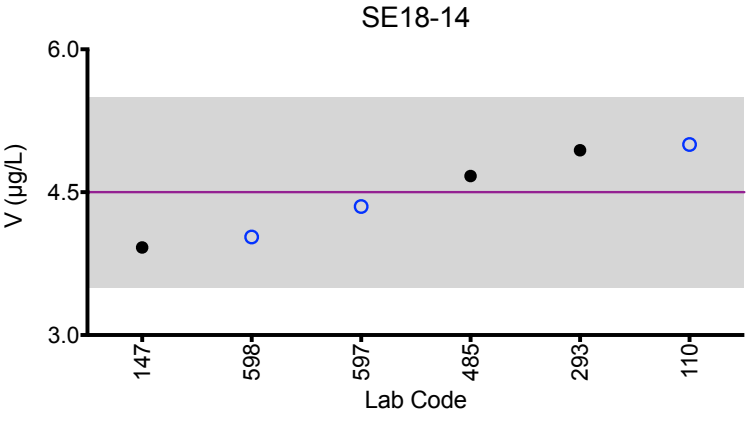
Results for Event #3, 2018: Summary Figures

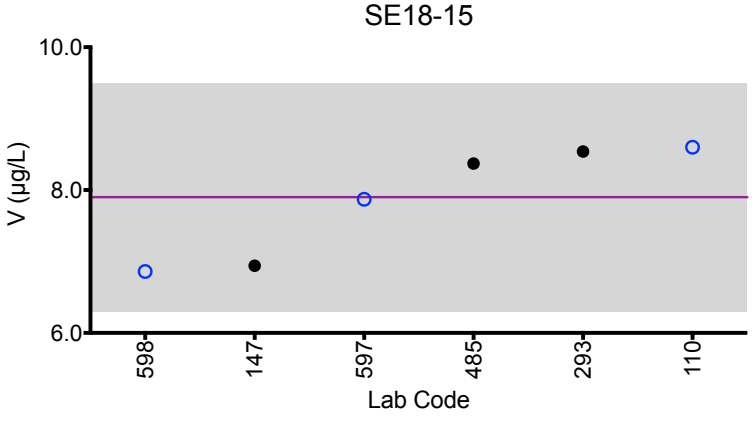
Serum V











Legend:
o CHEAR 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.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Serum Ba (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
110	ICP-MS	0.9	1.0	1.1	0.6	<0.5
147	ICP-MS	0.654	0.706	0.929	< 0.247	< 0.247
598	ICP-MS	0.87	1.29	1.46	0.43	0.37
Summary Statistics						
		SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Arithmetic Mean ($\bar{x}$)		0.81	1.0	1.2	0.52	0.37
Arithmetic SD (s)		0.13	0.3	0.3	0.12	NA
Arithmetic RSD (%)		16	30	25	23	NA
Number of Sample Measurements (N)		3	3	3	2	1

*Denotes a statistical Outlier.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Serum Be (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
110	ICP-MS	1.74	5.51	4.05	0.43	1.01
147	ICP-MS	1.32	4.02	2.85	< 0.523	0.795
598	ICP-MS	1.49	4.39	3.55	0.49	1.05
Summary Statistics						
		SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Arithmetic Mean ($\bar{x}$)		1.52	4.6	3.5	0.46	0.95
Arithmetic SD (s)		0.21	0.8	0.6	0.04	0.14
Arithmetic RSD (%)		14	17	17	8.7	15
Number of Sample Measurements (N)		3	3	3	2	3

*Denotes a statistical Outlier.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Serum Cs (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
110	ICP-MS	0.23	0.22	0.37	0.28	0.27
597	DRC/CC-ICP-MS	0.287	0.250	0.458	0.345	0.309
598	ICP-MS	0.211	0.192	0.353	0.256	0.233
Summary Statistics						
		SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Arithmetic Mean ($\bar{x}$)		0.24	0.22	0.39	0.29	0.27
Arithmetic SD (s)		0.04	0.03	0.06	0.05	0.04
Arithmetic RSD (%)		17	14	15	17	15
Number of Sample Measurements (N)		3	3	3	3	3

*Denotes a statistical Outlier.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Serum Fe (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
457	ICP-AES/OES	407.0	387	647	285	299
483	DRC/CC-ICP-MS	423	427	667	331	325
Summary Statistics						
		SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Arithmetic Mean ($\bar{x}$)		415	410	657	310	312
Arithmetic SD (s)		11	30	14	30	18
Arithmetic RSD (%)		2.7	7.3	2.1	9.7	5.8
Number of Sample Measurements (N)		2	2	2	2	2

*Denotes a statistical Outlier.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Serum Pt (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
110	ICP-MS	0.2	0.8	1.9	0.1	0.5
598	ICP-MS	0.18	0.66	1.71	0.07	0.42
Summary Statistics						
		SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Arithmetic Mean ($\bar{x}$)		0.190	0.73	1.80	0.085	0.46
Arithmetic SD (s)		0.014	0.10	0.13	0.021	0.06
Arithmetic RSD (%)		7.4	14	7.2	25	13
Number of Sample Measurements (N)		2	2	2	2	2

*Denotes a statistical Outlier.

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Serum Sn (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
110	ICP-MS	1.5	7.9	10.1	3.0	5.8
147	ICP-MS	1.25	7.79	11.3	2.45	5.99
597	DRC/CC-ICP-MS	1.50	7.99	10.3	3.05	6.09
598	ICP-MS	1.31	6.80	10.36	2.77	5.15
Summary Statistics						
		SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Arithmetic Mean ($\bar{x}$)		1.39	7.6	10.5	2.82	5.8
Arithmetic SD (s)		0.13	0.6	0.5	0.27	0.4
Arithmetic RSD (%)		9.4	7.9	4.8	9.6	6.9
Number of Sample Measurements (N)		4	4	4	4	4

*Denotes a statistical Outlier.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Serum Sr (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
103	DRC/CC-ICP-MS	37.1	128	35.1	81.8	74.8
200	ICP-MS	35.4	127	32.3	78.2	69.2
Summary Statistics						
		SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Arithmetic Mean ($\bar{x}$)		36.3	127.5	33.7	80	72
Arithmetic SD (s)		1.2	0.7	2.0	3	4
Arithmetic RSD (%)		3.3	0.55	5.9	3.8	5.6
Number of Sample Measurements (N)		2	2	2	2	2

*Denotes a statistical Outlier.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Serum Ti (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
200	DRC/CC-ICP-MS	5.3	8.4	2.9	7.2	11
485	HR-ICP-MS	13.8	8.00	2.40	9.06	13.5
Summary Statistics						
		SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Arithmetic Mean ($\bar{x}$)		NA	8.2	2.7	8.1	12.3
Arithmetic SD (s)		NA	0.3	0.4	1.3	1.8
Arithmetic RSD (%)		NA	3.7	15	16	15
Number of Sample Measurements (N)		NA	2	2	2	2

*Denotes a statistical Outlier.

Statistical data were not calculated for SE18-11 based on a lack of consensus among participating labs.

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Serum Tl (µg/L)

Lab Code	Method	SE18-11	SE18-12	SE18-13	SE18-14	SE18-15
103	DRC/CC-ICP-MS	3.58	1.91	1.27	3.92	4.82
110	ICP-MS	3.34	1.87	1.28	3.83	4.79
147	ICP-MS	2.94	1.60	1.18	3.27	4.52
598	ICP-MS	2.55	1.37	0.93	2.75	3.27

Summary Statistics

	SE18-11	SE18-12	SE18-13	SE18-14	SE18-15
Arithmetic Mean ($\bar{x}$)	3.1	1.69	1.17	3.4	4.3
Arithmetic SD (s)	0.5	0.25	0.16	0.5	0.7
Arithmetic RSD (%)	16	15	14	15	16
Number of Sample Measurements (N)	4	4	4	4	4

*Denotes a statistical Outlier.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Serum U (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
103	DRC/CC-ICP-MS	0.0468	0.164	0.0151	0.0313	0.108
110	ICP-MS	0.045	0.149	0.012	0.029	0.108
147	ICP-MS	0.0357	0.120	0.0115	0.0195	0.0876
598	ICP-MS	0.04	0.13	0.02	0.03	0.09
Summary Statistics						
		SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Arithmetic Mean ($\bar{x}$)		0.042	0.141	0.015	0.027	0.098
Arithmetic SD (s)		0.005	0.020	0.004	0.005	0.011
Arithmetic RSD (%)		12	14	27	19	11
Number of Sample Measurements (N)		4	4	4	4	4

*Denotes a statistical Outlier.

Results for Event #3, 2018:
Laboratory Data and Summary Statistics

Serum W (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
110	ICP-MS	0.37	0.47	0.18	0.92	0.68
147	ICP-MS	0.412	0.513	0.186	0.951	0.743
200	ICP-MS	0.42	0.45	0.17	0.92	0.6
598	ICP-MS	0.42	0.49	0.19	0.94	0.58
Summary Statistics						
		SE18-11	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
Arithmetic Mean ($\bar{x}$)		0.406	0.481	0.181	0.933	0.65
Arithmetic SD (s)		0.024	0.027	0.009	0.015	0.08
Arithmetic RSD (%)		5.9	5.6	5.0	1.6	12
Number of Sample Measurements (N)		4	4	4	4	4

*Denotes a statistical Outlier.

NEW YORK STATE | Department of Health | Wadsworth Center

Results for Event #3, 2018: Additional Elements in Serum

Serum Ag (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
147	ICP-MS	< 0.227	< 0.227	< 0.227	0.457	0.571

Serum B (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
200	ICP-MS	77	43	53	83	80

Serum Bi (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
147	ICP-MS	< 0.230	< 0.230	< 0.230	< 0.230	< 0.230

Serum I (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
147	ICP-MS	42.8	42.3	42.5	64.3	63.9

Serum Li (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
147	ICP-MS	0.314	0.231	6.90	0.382	0.406

Serum Mg (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
597	DRC/CC-ICP-MS	16100	16300	15100	20200	20600

Serum Te (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
147	ICP-MS	< 0.153	< 0.153	< 0.153	< 0.153	< 0.153

Serum Th (µg/L)						
Lab Code	**Method**	**SE18-11**	**SE18-12**	**SE18-13**	**SE18-14**	**SE18-15**
147	ICP-MS	< 0.00882	< 0.00882	< 0.00882	< 0.00882	< 0.00882

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.