	A	B	C	D	E	F	G	H	I	J	K	L
1						UCL Statistics for Data Sets with Non-Detects						
2												
3			User Selected Options									
4		Date/Time of Computation				3/6/2016 10:01:48 PM						
5			From File			ProUCLinput_49-004_0-5.xls						
6			Full Precision			OFF						
7		Confidence Coefficient				95%						
8		Number of Bootstrap Operations				2000						
9												
10	Antimony											
11												
12						General Statistics						
13		Total Number of Observations				150		Number of Distinct Observations				62
14		Number of Detects				96		Number of Non-Detects				54
15		Number of Distinct Detects				40		Number of Distinct Non-Detects				33
16		Minimum Detect				0.074		Minimum Non-Detect				0.17
17		Maximum Detect				0.45		Maximum Non-Detect				6.4
18		Variance Detects				0.00899		Percent Non-Detects				36%
19		Mean Detects				0.204		SD Detects				0.0948
20		Median Detects				0.175		CV Detects				0.466
21		Skewness Detects				0.82		Kurtosis Detects				-0.165
22		Mean of Logged Detects				-1.696		SD of Logged Detects				0.459
23												
24						Normal GOF Test on Detects Only						
25		Shapiro Wilk Test Statistic				0.906		Normal GOF Test on Detected Observations Only				
26		5% Shapiro Wilk P Value				8.1275E-8		Detected Data Not Normal at 5% Significance Level				
27		Lilliefors Test Statistic				0.138		Lilliefors GOF Test				
28		5% Lilliefors Critical Value				0.0904		Detected Data Not Normal at 5% Significance Level				
29						Detected Data Not Normal at 5% Significance Level						
30												
31						Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs						
32		Mean				0.193		Standard Error of Mean				0.00854
33		SD				0.0899		95% KM (BCA) UCL				0.206
34		95% KM (t) UCL				0.207		95% KM (Percentile Bootstrap) UCL				0.206
35		95% KM (z) UCL				0.207		95% KM Bootstrap t UCL				0.208
36		90% KM Chebyshev UCL				0.219		95% KM Chebyshev UCL				0.23
37		97.5% KM Chebyshev UCL				0.246		99% KM Chebyshev UCL				0.278
38												
39						Gamma GOF Tests on Detected Observations Only						
40		A-D Test Statistic				0.913		Anderson-Darling GOF Test				
41		5% A-D Critical Value				0.755		Detected Data Not Gamma Distributed at 5% Significance Level				
42		K-S Test Statistic				0.0999		Kolmogrov-Smirnoff GOF				
43		5% K-S Critical Value				0.0915		Detected Data Not Gamma Distributed at 5% Significance Level				
44						Detected Data Not Gamma Distributed at 5% Significance Level						
45												
46						Gamma Statistics on Detected Data Only						
47		k hat (MLE)				4.971		k star (bias corrected MLE)				4.822
48		Theta hat (MLE)				0.0409		Theta star (bias corrected MLE)				0.0422
49		nu hat (MLE)				954.4		nu star (bias corrected)				925.9
50		MLE Mean (bias corrected)				0.204		MLE Sd (bias corrected)				0.0927
51												
52						Gamma Kaplan-Meier (KM) Statistics						
53		k hat (KM)				4.601		nu hat (KM)				1380
54		Approximate Chi Square Value (N/A, α)				1295		Adjusted Chi Square Value (N/A, β)				1294
55		95% Gamma Approximate KM-UCL (use when n>=50)				0.206		mma Adjusted KM-UCL (use when n<50)				0.206
56												
57						Gamma ROS Statistics using Imputed Non-Detects						
58						GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs						
59						GROS may not be used when kstar of detected data is small such as < 0.1						
60						For such situations, GROS method tends to yield inflated values of UCLs and BTVs						
61						For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates						
62		Minimum				0.074		Mean				0.191
63		Maximum				0.45		Median				0.18
64		SD				0.0806		CV				0.422
65		k hat (MLE)				6.483		k star (bias corrected MLE)				6.358
66		Theta hat (MLE)				0.0295		Theta star (bias corrected MLE)				0.0301
67		nu hat (MLE)				1945		nu star (bias corrected)				1907
68		MLE Mean (bias corrected)				0.191		MLE Sd (bias corrected)				0.0758
69								Adjusted Level of Significance (β)				0.0484
70		Approximate Chi Square Value (N/A, α)				1807		Adjusted Chi Square Value (N/A, β)				1806
71		95% Gamma Approximate UCL (use when n>=50)				0.202		Gamma Adjusted UCL (use when n<50)				0.202
72												
73						Lognormal GOF Test on Detected Observations Only						
74		Lilliefors Test Statistic				0.0754		Lilliefors GOF Test				
75		5% Lilliefors Critical Value				0.0904		Detected Data appear Lognormal at 5% Significance Level				
76						Detected Data appear Approximate Lognormal at 5% Significance Level						
77												
78						Lognormal ROS Statistics Using Imputed Non-Detects						
79		Mean in Original Scale				0.19		Mean in Log Scale				-1.739
80		SD in Original Scale				0.0804		SD in Log Scale				0.39
81		95% t UCL (assumes normality of ROS data)				0.201		95% Percentile Bootstrap UCL				0.2
82		95% BCA Bootstrap UCL				0.201		95% Bootstrap t UCL				0.201
83		95% H-UCL (Log ROS)				0.201						
84												
85						UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed						

Row	A–E (label)	F	G–K (label)	L
86	KM Mean (logged)	-1.746	95% H-UCL (KM -Log)	0.206
87	KM SD (logged)	0.444	95% Critical H Value (KM-Log)	1.799
88	KM Standard Error of Mean (logged)	0.0432		
89				
90	**DL/2 Statistics**			
91	**DL/2 Normal**		**DL/2 Log-Transformed**	
92	Mean in Original Scale	0.279	Mean in Log Scale	-1.574
93	SD in Original Scale	0.411	SD in Log Scale	0.634
94	95% t UCL (Assumes normality)	0.335	95% H-Stat UCL	0.28
95	**DL/2 is not a recommended method, provided for comparisons and historical reasons**			
96				
97	**Nonparametric Distribution Free UCL Statistics**			
98	**Detected Data appear Approximate Lognormal Distributed at 5% Significance Level**			
99				
100	**Suggested UCL to Use**			
101	95% KM (BCA) UCL	0.206		
102				
103	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL			
104	Recommendations are based upon data size, data distribution, and skewness.			
105	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006)			
106	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician			
107				
108				
109	Barium			
110				
111	**General Statistics**			
112	Total Number of Observations	150	Number of Distinct Observations	100
113			Number of Missing Observations	0
114	Minimum	88.7	Mean	192
115	Maximum	403	Median	189
116	SD	46.47	Std. Error of Mean	3.794
117	Coefficient of Variation	0.242	Skewness	0.855
118				
119	**Normal GOF Test**			
120	Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk GOF Test**	
121	5% Shapiro Wilk P Value	0.0211	Data Not Normal at 5% Significance Level	
122	Lilliefors Test Statistic	0.0633	**Lilliefors GOF Test**	
123	5% Lilliefors Critical Value	0.0723	Data appear Normal at 5% Significance Level	
124	**Data appear Approximate Normal at 5% Significance Level**			
125				
126	**Assuming Normal Distribution**			
127	**95% Normal UCL**		**95% UCLs (Adjusted for Skewness)**	
128	95% Student's-t UCL	198.3	95% Adjusted-CLT UCL (Chen-1995)	198.5
129			95% Modified-t UCL (Johnson-1978)	198.3
130				
131	**Gamma GOF Test**			
132	A-D Test Statistic	0.352	**Anderson-Darling Gamma GOF Test**	
133	5% A-D Critical Value	0.751	Detected data appear Gamma Distributed at 5% Significance Leve	
134	K-S Test Statistic	0.049	**Kolmogrov-Smirnoff Gamma GOF Test**	
135	5% K-S Critical Value	0.0764	Detected data appear Gamma Distributed at 5% Significance Leve	
136	**Detected data appear Gamma Distributed at 5% Significance Level**			
137				
138	**Gamma Statistics**			
139	k hat (MLE)	17.85	k star (bias corrected MLE)	17.49
140	Theta hat (MLE)	10.76	Theta star (bias corrected MLE)	10.98
141	nu hat (MLE)	5354	nu star (bias corrected)	5248
142	MLE Mean (bias corrected)	192	MLE Sd (bias corrected)	45.91
143			Approximate Chi Square Value (0.05)	5080
144	Adjusted Level of Significance	0.0484	Adjusted Chi Square Value	5079
145				
146	**Assuming Gamma Distribution**			
147	95% Approximate Gamma UCL (use when n>=50))	198.3	95% Adjusted Gamma UCL (use when n<50)	198.4
148				
149	**Lognormal GOF Test**			
150	Shapiro Wilk Test Statistic	0.992	**Shapiro Wilk Lognormal GOF Test**	
151	5% Shapiro Wilk P Value	0.978	Data appear Lognormal at 5% Significance Level	
152	Lilliefors Test Statistic	0.0646	**Lilliefors Lognormal GOF Test**	
153	5% Lilliefors Critical Value	0.0723	Data appear Lognormal at 5% Significance Level	
154	**Data appear Lognormal at 5% Significance Level**			
155				
156	**Lognormal Statistics**			
157	Minimum of Logged Data	4.485	Mean of logged Data	5.229
158	Maximum of Logged Data	5.999	SD of logged Data	0.239
159				
160	**Assuming Lognormal Distribution**			
161	95% H-UCL	198.6	90% Chebyshev (MVUE) UCL	203.4
162	95% Chebyshev (MVUE) UCL	208.6	97.5% Chebyshev (MVUE) UCL	215.8
163	99% Chebyshev (MVUE) UCL	229.9		
164				
165	**Nonparametric Distribution Free UCL Statistics**			
166	**Data appear to follow a Discernible Distribution at 5% Significance Level**			
167				
168	**Nonparametric Distribution Free UCLs**			
169	95% CLT UCL	198.3	95% Jackknife UCL	198.3
170	95% Standard Bootstrap UCL	198.3	95% Bootstrap-t UCL	198.9

	A	B	C	D	E	F	G	H	I	J	K	L
171					95% Hall's Bootstrap UCL	198.4		95% Percentile Bootstrap UCL				198.3
172					95% BCA Bootstrap UCL	198.5						
173					90% Chebyshev(Mean, Sd) UCL	203.4		95% Chebyshev(Mean, Sd) UCL				208.6
174					97.5% Chebyshev(Mean, Sd) UCL	215.7		99% Chebyshev(Mean, Sd) UCL				229.8
175												
176						**Suggested UCL to Use**						
177					95% Student's-t UCL	198.3						
178												
179		Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL										
180		These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)										
181		and Singh and Singh (2003). However, simulations results will not cover all Real World data sets										
182		For additional insight the user may want to consult a statistician.										
183												
184	Cesium-137											
185												
186						**General Statistics**						
187				Total Number of Observations		167		Number of Distinct Observations				121
188				Number of Detects		38		Number of Non-Detects				129
189				Number of Distinct Detects		36		Number of Distinct Non-Detects				87
190				Minimum Detect		0.09		Minimum Non-Detect				-0.036
191				Maximum Detect		3.28		Maximum Non-Detect				0.168
192				Variance Detects		0.512		Percent Non-Detects				77.25%
193				Mean Detects		0.528		SD Detects				0.716
194				Median Detects		0.231		CV Detects				1.356
195				Skewness Detects		2.419		Kurtosis Detects				5.776
196												
197						**Normal GOF Test on Detects Only**						
198				Shapiro Wilk Test Statistic		0.619		**Shapiro Wilk GOF Test**				
199				5% Shapiro Wilk Critical Value		0.938		Detected Data Not Normal at 5% Significance Level				
200				Lilliefors Test Statistic		0.372		**Lilliefors GOF Test**				
201				5% Lilliefors Critical Value		0.144		Detected Data Not Normal at 5% Significance Level				
202						**Detected Data Not Normal at 5% Significance Level**						
203												
204						**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**						
205					Mean	0.0924		Standard Error of Mean				0.0323
206					SD	0.412		95% KM (BCA) UCL				0.16
207				95% KM (t) UCL		0.146		95% KM (Percentile Bootstrap) UCL				0.151
208				95% KM (z) UCL		0.146		95% KM Bootstrap t UCL				0.167
209				90% KM Chebyshev UCL		0.189		95% KM Chebyshev UCL				0.233
210				97.5% KM Chebyshev UCL		0.294		99% KM Chebyshev UCL				0.414
211												
212						**Gamma GOF Tests on Detected Observations Only**						
213				A-D Test Statistic		3.298		**Anderson-Darling GOF Test**				
214				5% A-D Critical Value		0.777		Detected Data Not Gamma Distributed at 5% Significance Level				
215				K-S Test Statistic		0.283		**Kolmogrov-Smirnoff GOF**				
216				5% K-S Critical Value		0.147		Detected Data Not Gamma Distributed at 5% Significance Level				
217						**Detected Data Not Gamma Distributed at 5% Significance Level**						
218												
219						**Gamma Statistics on Detected Data Only**						
220				k hat (MLE)		1.036		k star (bias corrected MLE)				0.972
221				Theta hat (MLE)		0.509		Theta star (bias corrected MLE)				0.543
222				nu hat (MLE)		78.75		nu star (bias corrected)				73.86
223			MLE Mean (bias corrected)			0.528		MLE Sd (bias corrected)				0.535
224												
225						**Gamma Kaplan-Meier (KM) Statistics**						
226					k hat (KM)	0.0505		nu hat (KM)				16.85
227								Adjusted Level of Significance (β)				0.0486
228			Approximate Chi Square Value (16.85, α)			8.567		Adjusted Chi Square Value (16.85, β)				8.516
229		95% Gamma Approximate KM-UCL (use when n>=50)				0.182		95% Gamma Adjusted KM-UCL (use when n<50)				0.183
230						Gamma (KM) may not be used when k hat (KM) is < 0.1						
231												
232						**DL/2 Statistics**						
233				Mean in Original Scale		0.132		SD in Original Scale				0.401
234				95% t UCL (Assumes normality)		0.183						
235						**DL/2 is not a recommended method, provided for comparisons and historical reasons**						
236												
237						**Nonparametric Distribution Free UCL Statistics**						
238						**Data do not follow a Discernible Distribution at 5% Significance Level**						
239												
240						**Suggested UCL to Use**						
241				97.5% KM (Chebyshev) UCL		0.294						
242												
243		Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL										
244		Recommendations are based upon data size, data distribution, and skewness.										
245		These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006)										
246		However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician										
247												
248												
249	Chromium											
250												
251						**General Statistics**						
252				Total Number of Observations		150		Number of Distinct Observations				67
253								Number of Missing Observations				0
254					Minimum	4.9		Mean				9.617
255					Maximum	14.4		Median				9.7

	A	B	C	D	E	F	G	H	I	J	K	L
256					SD	1.754				Std. Error of Mean		0.143
257			Coefficient of Variation			0.182				Skewness		-0.0679
258												
259						**Normal GOF Test**						
260			Shapiro Wilk Test Statistic			0.985			**Shapiro Wilk GOF Test**			
261			5% Shapiro Wilk P Value			0.741			Data appear Normal at 5% Significance Level			
262			Lilliefors Test Statistic			0.0473			**Lilliefors GOF Test**			
263			5% Lilliefors Critical Value			0.0723			Data appear Normal at 5% Significance Level			
264					**Data appear Normal at 5% Significance Level**							
265												
266						**Assuming Normal Distribution**						
267			**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**			
268			95% Student's-t UCL			9.854			95% Adjusted-CLT UCL (Chen-1995)			9.851
269									95% Modified-t UCL (Johnson-1978)			9.854
270												
271						**Gamma GOF Test**						
272			A-D Test Statistic			0.761			**Anderson-Darling Gamma GOF Test**			
273			5% A-D Critical Value			0.75			Data Not Gamma Distributed at 5% Significance Level			
274			K-S Test Statistic			0.0724			**Kolmogrov-Smirnoff Gamma GOF Test**			
275			5% K-S Critical Value			0.0764		Detected data appear Gamma Distributed at 5% Significance Level				
276					**Detected data follow Appr. Gamma Distribution at 5% Significance Level**							
277												
278						**Gamma Statistics**						
279			k hat (MLE)			28.49			k star (bias corrected MLE)			27.92
280			Theta hat (MLE)			0.338			Theta star (bias corrected MLE)			0.344
281			nu hat (MLE)		8547				nu star (bias corrected)			8377
282			MLE Mean (bias corrected)			9.617			MLE Sd (bias corrected)			1.82
283									Approximate Chi Square Value (0.05)			8165
284			Adjusted Level of Significance			0.0484			Adjusted Chi Square Value			8163
285												
286						**Assuming Gamma Distribution**						
287		95% Approximate Gamma UCL (use when n>=50))				9.866		95% Adjusted Gamma UCL (use when n<50)				9.868
288												
289						**Lognormal GOF Test**						
290			Shapiro Wilk Test Statistic			0.962			**Shapiro Wilk Lognormal GOF Test**			
291			5% Shapiro Wilk P Value			0.00455			Data Not Lognormal at 5% Significance Level			
292			Lilliefors Test Statistic			0.0851			**Lilliefors Lognormal GOF Test**			
293			5% Lilliefors Critical Value			0.0723			Data Not Lognormal at 5% Significance Level			
294					**Data Not Lognormal at 5% Significance Level**							
295												
296						**Lognormal Statistics**						
297			Minimum of Logged Data			1.589			Mean of logged Data			2.246
298			Maximum of Logged Data			2.667			SD of logged Data			0.193
299												
300						**Assuming Lognormal Distribution**						
301			95% H-UCL			9.886			90% Chebyshev (MVUE) UCL			10.08
302			95% Chebyshev (MVUE) UCL			10.29			97.5% Chebyshev (MVUE) UCL			10.58
303			99% Chebyshev (MVUE) UCL			11.14						
304												
305					**Nonparametric Distribution Free UCL Statistics**							
306					**Data appear to follow a Discernible Distribution at 5% Significance Level**							
307												
308						**Nonparametric Distribution Free UCLs**						
309			95% CLT UCL			9.852			95% Jackknife UCL			9.854
310			95% Standard Bootstrap UCL			9.852			95% Bootstrap-t UCL			9.866
311			95% Hall's Bootstrap UCL			9.865			95% Percentile Bootstrap UCL			9.849
312			95% BCA Bootstrap UCL			9.859						
313			90% Chebyshev(Mean, Sd) UCL			10.05			95% Chebyshev(Mean, Sd) UCL			10.24
314			97.5% Chebyshev(Mean, Sd) UCL			10.51			99% Chebyshev(Mean, Sd) UCL			11.04
315												
316						**Suggested UCL to Use**						
317			95% Student's-t UCL			9.854						
318												
319		Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL										
320		These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)										
321		and Singh and Singh (2003). However, simulations results will not cover all Real World data sets										
322		For additional insight the user may want to consult a statistician.										
323												
324		**Note: For highly negatively-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be**										
325		**reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**										
326												
327												
328	Cobalt											
329												
330						**General Statistics**						
331			Total Number of Observations			150			Number of Distinct Observations			58
332									Number of Missing Observations			0
333			Minimum			2.5			Mean			6.268
334			Maximum			14.9			Median			6.3
335			SD			1.551			Std. Error of Mean			0.127
336			Coefficient of Variation			0.248			Skewness			1.013
337												
338						**Normal GOF Test**						
339			Shapiro Wilk Test Statistic			0.953			**Shapiro Wilk GOF Test**			
340			5% Shapiro Wilk P Value			2.2830E-4			Data Not Normal at 5% Significance Level			

	A	B	C	D	E	F	G	H	I	J	K	L
341				Lilliefors Test Statistic		0.0729			**Lilliefors GOF Test**			
342				5% Lilliefors Critical Value		0.0723			Data Not Normal at 5% Significance Level			
343					**Data Not Normal at 5% Significance Level**							
344												
345					**Assuming Normal Distribution**							
346				**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**			
347				95% Student's-t UCL		6.477			95% Adjusted-CLT UCL (Chen-1995)			6.487
348									95% Modified-t UCL (Johnson-1978)			6.479
349												
350					**Gamma GOF Test**							
351				A-D Test Statistic		1.257			**Anderson-Darling Gamma GOF Test**			
352				5% A-D Critical Value		0.751			Data Not Gamma Distributed at 5% Significance Level			
353				K-S Test Statistic		0.082			**Kolmogrov-Smirnoff Gamma GOF Test**			
354				5% K-S Critical Value		0.0764			Data Not Gamma Distributed at 5% Significance Level			
355					**Data Not Gamma Distributed at 5% Significance Level**							
356												
357					**Gamma Statistics**							
358				k hat (MLE)		16.46			k star (bias corrected MLE)			16.13
359				Theta hat (MLE)		0.381			Theta star (bias corrected MLE)			0.389
360				nu hat (MLE)		4937			nu star (bias corrected)			4839
361				MLE Mean (bias corrected)		6.268			MLE Sd (bias corrected)			1.561
362									Approximate Chi Square Value (0.05)			4679
363				Adjusted Level of Significance		0.0484			Adjusted Chi Square Value			4677
364												
365					**Assuming Gamma Distribution**							
366			95% Approximate Gamma UCL (use when n>=50))			6.483		95% Adjusted Gamma UCL (use when n<50)				6.485
367												
368					**Lognormal GOF Test**							
369				Shapiro Wilk Test Statistic		0.964			**Shapiro Wilk Lognormal GOF Test**			
370				5% Shapiro Wilk P Value		0.00853			Data Not Lognormal at 5% Significance Level			
371				Lilliefors Test Statistic		0.0978			**Lilliefors Lognormal GOF Test**			
372				5% Lilliefors Critical Value		0.0723			Data Not Lognormal at 5% Significance Level			
373					**Data Not Lognormal at 5% Significance Level**							
374												
375					**Lognormal Statistics**							
376				Minimum of Logged Data		0.916			Mean of logged Data			1.805
377				Maximum of Logged Data		2.701			SD of logged Data			0.254
378												
379					**Assuming Lognormal Distribution**							
380				95% H-UCL		6.505			90% Chebyshev (MVUE) UCL			6.671
381			95% Chebyshev (MVUE) UCL			6.851			97.5% Chebyshev (MVUE) UCL			7.099
382			99% Chebyshev (MVUE) UCL			7.588						
383												
384					**Nonparametric Distribution Free UCL Statistics**							
385					**Data do not follow a Discernible Distribution (0.05)**							
386												
387					**Nonparametric Distribution Free UCLs**							
388				95% CLT UCL		6.476			95% Jackknife UCL			6.477
389			95% Standard Bootstrap UCL			6.479			95% Bootstrap-t UCL			6.483
390			95% Hall's Bootstrap UCL			6.504			95% Percentile Bootstrap UCL			6.483
391			95% BCA Bootstrap UCL			6.496						
392			90% Chebyshev(Mean, Sd) UCL			6.648			95% Chebyshev(Mean, Sd) UCL			6.82
393			97.5% Chebyshev(Mean, Sd) UCL			7.059			99% Chebyshev(Mean, Sd) UCL			7.528
394												
395					**Suggested UCL to Use**							
396				95% Student's-t UCL		6.477			or 95% Modified-t UCL			6.479
397												
398		Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL										
399		These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)										
400		and Singh and Singh (2003). However, simulations results will not cover all Real World data sets										
401		For additional insight the user may want to consult a statistician.										
402												
403												
404	Copper											
405												
406					**General Statistics**							
407			Total Number of Observations			150			Number of Distinct Observations			82
408									Number of Missing Observations			0
409				Minimum		4			Mean			9.707
410				Maximum		120			Median			8
411				SD		9.798			Std. Error of Mean			0.8
412				Coefficient of Variation		1.009			Skewness			9.785
413												
414					**Normal GOF Test**							
415				Shapiro Wilk Test Statistic		0.342			**Shapiro Wilk GOF Test**			
416				5% Shapiro Wilk P Value		0			Data Not Normal at 5% Significance Level			
417				Lilliefors Test Statistic		0.28			**Lilliefors GOF Test**			
418				5% Lilliefors Critical Value		0.0723			Data Not Normal at 5% Significance Level			
419					**Data Not Normal at 5% Significance Level**							
420												
421					**Assuming Normal Distribution**							
422				**95% Normal UCL**					**95% UCLs (Adjusted for Skewness)**			
423				95% Student's-t UCL		11.03			95% Adjusted-CLT UCL (Chen-1995)			11.71
424									95% Modified-t UCL (Johnson-1978)			11.14
425												

	A	B	C	D	E	F	G	H	I	J	K	L
426						Gamma GOF Test						
427				A-D Test Statistic		6.667E+28			Anderson-Darling Gamma GOF Test			
428				5% A-D Critical Value		0.756		Data Not Gamma Distributed at 5% Significance Level				
429				K-S Test Statistic		0.206			Kolmogrov-Smirnoff Gamma GOF Test			
430				5% K-S Critical Value		0.0768		Data Not Gamma Distributed at 5% Significance Level				
431						Data Not Gamma Distributed at 5% Significance Level						
432												
433						Gamma Statistics						
434				k hat (MLE)		4.043			k star (bias corrected MLE)			3.967
435				Theta hat (MLE)		2.401			Theta star (bias corrected MLE)			2.447
436				nu hat (MLE)		1213			nu star (bias corrected)			1190
437			MLE Mean (bias corrected)			9.707			MLE Sd (bias corrected)			4.874
438									Approximate Chi Square Value (0.05)			1111
439			Adjusted Level of Significance			0.0484			Adjusted Chi Square Value			1110
440												
441						Assuming Gamma Distribution						
442		95% Approximate Gamma UCL (use when n>=50))				10.4		Adjusted Gamma UCL (use when n<50)				10.4
443												
444						Lognormal GOF Test						
445			Shapiro Wilk Test Statistic			0.882			Shapiro Wilk Lognormal GOF Test			
446			5% Shapiro Wilk P Value			0		Data Not Lognormal at 5% Significance Level				
447			Lilliefors Test Statistic			0.154			Lilliefors Lognormal GOF Test			
448			5% Lilliefors Critical Value			0.0723		Data Not Lognormal at 5% Significance Level				
449						Data Not Lognormal at 5% Significance Level						
450												
451						Lognormal Statistics						
452			Minimum of Logged Data			1.386			Mean of logged Data			2.144
453			Maximum of Logged Data			4.787			SD of logged Data			0.413
454												
455						Assuming Lognormal Distribution						
456				95% H-UCL		9.873			90% Chebyshev (MVUE) UCL			10.27
457			95% Chebyshev (MVUE) UCL			10.71			97.5% Chebyshev (MVUE) UCL			11.32
458			99% Chebyshev (MVUE) UCL			12.53						
459												
460						Nonparametric Distribution Free UCL Statistics						
461						Data do not follow a Discernible Distribution (0.05)						
462												
463						Nonparametric Distribution Free UCLs						
464				95% CLT UCL		11.02			95% Jackknife UCL			11.03
465			95% Standard Bootstrap UCL			11.01			95% Bootstrap-t UCL			12.82
466			95% Hall's Bootstrap UCL			16.26			95% Percentile Bootstrap UCL			11.12
467			95% BCA Bootstrap UCL			12.18						
468			90% Chebyshev(Mean, Sd) UCL			12.11			95% Chebyshev(Mean, Sd) UCL			13.19
469			97.5% Chebyshev(Mean, Sd) UCL			14.7			99% Chebyshev(Mean, Sd) UCL			17.67
470												
471						Suggested UCL to Use						
472				95% Student's-t UCL		11.03			or 95% Modified-t UCL			11.14
473												
474		Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL										
475		These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)										
476		and Singh and Singh (2003). However, simulations results will not cover all Real World data sets										
477		For additional insight the user may want to consult a statistician.										
478												
479												
480												
481	Lead											
482												
483						General Statistics						
484			Total Number of Observations			150			Number of Distinct Observations			83
485									Number of Missing Observations			0
486				Minimum		5.6				Mean		15.75
487				Maximum		45.5				Median		15.3
488				SD		4.396			Std. Error of Mean			0.359
489			Coefficient of Variation			0.279				Skewness		2.813
490												
491						Normal GOF Test						
492			Shapiro Wilk Test Statistic			0.821			Shapiro Wilk GOF Test			
493			5% Shapiro Wilk P Value			0		Data Not Normal at 5% Significance Level				
494			Lilliefors Test Statistic			0.158			Lilliefors GOF Test			
495			5% Lilliefors Critical Value			0.0723		Data Not Normal at 5% Significance Level				
496						Data Not Normal at 5% Significance Level						
497												
498						Assuming Normal Distribution						
499		95% Normal UCL						95% UCLs (Adjusted for Skewness)				
500			95% Student's-t UCL			16.34		95% Adjusted-CLT UCL (Chen-1995)				16.43
501								95% Modified-t UCL (Johnson-1978)				16.36
502												
503						Gamma GOF Test						
504				A-D Test Statistic		2.709			Anderson-Darling Gamma GOF Test			
505				5% A-D Critical Value		0.751		Data Not Gamma Distributed at 5% Significance Level				
506				K-S Test Statistic		0.118			Kolmogrov-Smirnoff Gamma GOF Test			
507				5% K-S Critical Value		0.0764		Data Not Gamma Distributed at 5% Significance Level				
508						Data Not Gamma Distributed at 5% Significance Level						
509												
510						Gamma Statistics						

	A	B	C	D	E	F	G	H	I	J	K	L
511				k hat (MLE)		15.98			k star (bias corrected MLE)			15.67
512				Theta hat (MLE)		0.985			Theta star (bias corrected MLE)			1.005
513				nu hat (MLE)		4795			nu star (bias corrected)			4701
514			MLE Mean (bias corrected)			15.75			MLE Sd (bias corrected)			3.978
515								Approximate Chi Square Value (0.05)				4543
516			Adjusted Level of Significance			0.0484			Adjusted Chi Square Value			4541
517												
518						**Assuming Gamma Distribution**						
519		95% Approximate Gamma UCL (use when n>=50))				16.3		Adjusted Gamma UCL (use when n<50)				16.3
520												
521						**Lognormal GOF Test**						
522			Shapiro Wilk Test Statistic			0.954			**Shapiro Wilk Lognormal GOF Test**			
523			5% Shapiro Wilk P Value			2.9628E-4			Data Not Lognormal at 5% Significance Level			
524			Lilliefors Test Statistic			0.103			**Lilliefors Lognormal GOF Test**			
525			5% Lilliefors Critical Value			0.0723			Data Not Lognormal at 5% Significance Level			
526				**Data Not Lognormal at 5% Significance Level**								
527												
528						**Lognormal Statistics**						
529			Minimum of Logged Data			1.723			Mean of logged Data			2.725
530			Maximum of Logged Data			3.818			SD of logged Data			0.247
531												
532						**Assuming Lognormal Distribution**						
533				95% H-UCL		16.28			90% Chebyshev (MVUE) UCL			16.69
534			95% Chebyshev (MVUE) UCL			17.13			97.5% Chebyshev (MVUE) UCL			17.74
535			99% Chebyshev (MVUE) UCL			18.93						
536												
537						**Nonparametric Distribution Free UCL Statistics**						
538						**Data do not follow a Discernible Distribution (0.05)**						
539												
540						**Nonparametric Distribution Free UCLs**						
541				95% CLT UCL		16.34			95% Jackknife UCL			16.34
542			95% Standard Bootstrap UCL			16.33			95% Bootstrap-t UCL			16.46
543			95% Hall's Bootstrap UCL			16.55			95% Percentile Bootstrap UCL			16.37
544			95% BCA Bootstrap UCL			16.42						
545			90% Chebyshev(Mean, Sd) UCL			16.82			95% Chebyshev(Mean, Sd) UCL			17.31
546			97.5% Chebyshev(Mean, Sd) UCL			17.99			99% Chebyshev(Mean, Sd) UCL			19.32
547												
548						**Suggested UCL to Use**						
549			95% Student's-t UCL			16.34			or 95% Modified-t UCL			16.36
550												
551		Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL										
552		These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)										
553		and Singh and Singh (2003). However, simulations results will not cover all Real World data sets										
554		For additional insight the user may want to consult a statistician.										
555												
556												
557												
558	Nickel											
559												
560						**General Statistics**						
561			Total Number of Observations			150		Number of Distinct Observations				64
562								Number of Missing Observations				0
563				Minimum		4.9			Mean			8.764
564				Maximum		19.6			Median			8.65
565				SD		1.859			Std. Error of Mean			0.152
566			Coefficient of Variation			0.212			Skewness			1.468
567												
568						**Normal GOF Test**						
569			Shapiro Wilk Test Statistic			0.932			**Shapiro Wilk GOF Test**			
570			5% Shapiro Wilk P Value			3.2954E-8			Data Not Normal at 5% Significance Level			
571			Lilliefors Test Statistic			0.094			**Lilliefors GOF Test**			
572			5% Lilliefors Critical Value			0.0723			Data Not Normal at 5% Significance Level			
573				**Data Not Normal at 5% Significance Level**								
574												
575						**Assuming Normal Distribution**						
576			**95% Normal UCL**						**95% UCLs (Adjusted for Skewness)**			
577			95% Student's-t UCL			9.016		95% Adjusted-CLT UCL (Chen-1995)				9.034
578								95% Modified-t UCL (Johnson-1978)				9.019
579												
580						**Gamma GOF Test**						
581			A-D Test Statistic			0.818			**Anderson-Darling Gamma GOF Test**			
582			5% A-D Critical Value			0.75			Data Not Gamma Distributed at 5% Significance Level			
583			K-S Test Statistic			0.0657			**Kolmogrov-Smirnoff Gamma GOF Test**			
584			5% K-S Critical Value			0.0764		Detected data appear Gamma Distributed at 5% Significance Level					
585				**Detected data follow Appr. Gamma Distribution at 5% Significance Level**								
586												
587						**Gamma Statistics**						
588				k hat (MLE)		24.22			k star (bias corrected MLE)			23.74
589				Theta hat (MLE)		0.362			Theta star (bias corrected MLE)			0.369
590				nu hat (MLE)		7266			nu star (bias corrected)			7122
591			MLE Mean (bias corrected)			8.764			MLE Sd (bias corrected)			1.799
592								Approximate Chi Square Value (0.05)				6927
593			Adjusted Level of Significance			0.0484			Adjusted Chi Square Value			6925
594												
595						**Assuming Gamma Distribution**						

	A	B	C	D	E	F	G	H	I	J	K	L
596	95% Approximate Gamma UCL (use when n>=50)					9.011	6 Adjusted Gamma UCL (use when n<50)					9.014
597												
598						Lognormal GOF Test						
599	Shapiro Wilk Test Statistic					0.978	Shapiro Wilk Lognormal GOF Test					
600	5% Shapiro Wilk P Value					0.3	Data appear Lognormal at 5% Significance Level					
601	Lilliefors Test Statistic					0.0677	Lilliefors Lognormal GOF Test					
602	5% Lilliefors Critical Value					0.0723	Data appear Lognormal at 5% Significance Level					
603	Data appear Lognormal at 5% Significance Level											
604												
605						Lognormal Statistics						
606	Minimum of Logged Data					1.589	Mean of logged Data					2.15
607	Maximum of Logged Data					2.976	SD of logged Data					0.203
608												
609						Assuming Lognormal Distribution						
610	95% H-UCL					9.015	90% Chebyshev (MVUE) UCL					9.204
611	95% Chebyshev (MVUE) UCL					9.403	97.5% Chebyshev (MVUE) UCL					9.681
612	99% Chebyshev (MVUE) UCL					10.23						
613												
614						Nonparametric Distribution Free UCL Statistics						
615						Data appear to follow a Discernible Distribution at 5% Significance Level						
616												
617						Nonparametric Distribution Free UCLs						
618	95% CLT UCL					9.014	95% Jackknife UCL					9.016
619	95% Standard Bootstrap UCL					9.016	95% Bootstrap-t UCL					9.034
620	95% Hall's Bootstrap UCL					9.059	95% Percentile Bootstrap UCL					9.018
621	95% BCA Bootstrap UCL					9.024						
622	90% Chebyshev(Mean, Sd) UCL					9.22	95% Chebyshev(Mean, Sd) UCL					9.426
623	97.5% Chebyshev(Mean, Sd) UCL					9.712	99% Chebyshev(Mean, Sd) UCL					10.27
624												
625						Suggested UCL to Use						
626	95% Approximate Gamma UCL					9.011						
627												
628	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL											
629	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
630	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets											
631	For additional insight the user may want to consult a statistician.											
632												
633	Plutonium-239/240											
634												
635						General Statistics						
636	Total Number of Observations			150			Number of Distinct Observations			111		
637	Number of Detects			33			Number of Non-Detects			117		
638	Number of Distinct Detects			29			Number of Distinct Non-Detects			86		
639	Minimum Detect			0.011			Minimum Non-Detect			-0.0319		
640	Maximum Detect			0.998			Maximum Non-Detect			0.04		
641	Variance Detects			0.0318			Percent Non-Detects			78%		
642	Mean Detects			0.096			SD Detects			0.178		
643	Median Detects			0.056			CV Detects			1.857		
644	Skewness Detects			4.47			Kurtosis Detects			21.8		
645												
646						Normal GOF Test on Detects Only						
647	Shapiro Wilk Test Statistic			0.442			Shapiro Wilk GOF Test					
648	5% Shapiro Wilk Critical Value			0.931			Detected Data Not Normal at 5% Significance Level					
649	Lilliefors Test Statistic			0.325			Lilliefors GOF Test					
650	5% Lilliefors Critical Value			0.154			Detected Data Not Normal at 5% Significance Level					
651	Detected Data Not Normal at 5% Significance Level											
652												
653	Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs											
654	Mean			-0.00267			Standard Error of Mean			0.00814		
655	SD			0.0979			95% KM (BCA) UCL			0.0209		
656	95% KM (t) UCL			0.0108			95% KM (Percentile Bootstrap) UCL			0.0157		
657	95% KM (z) UCL			0.0107			95% KM Bootstrap t UCL			0.0231		
658	90% KM Chebyshev UCL			0.0218			95% KM Chebyshev UCL			0.0328		
659	97.5% KM Chebyshev UCL			0.0482			99% KM Chebyshev UCL			0.0784		
660												
661						Gamma GOF Tests on Detected Observations Only						
662	A-D Test Statistic			1.689			Anderson-Darling GOF Test					
663	5% A-D Critical Value			0.78			Detected Data Not Gamma Distributed at 5% Significance Level					
664	K-S Test Statistic			0.191			Kolmogrov-Smirnoff GOF					
665	5% K-S Critical Value			0.158			Detected Data Not Gamma Distributed at 5% Significance Level					
666	Detected Data Not Gamma Distributed at 5% Significance Level											
667												
668						Gamma Statistics on Detected Data Only						
669	k hat (MLE)			0.902			k star (bias corrected MLE)			0.84		
670	Theta hat (MLE)			0.106			Theta star (bias corrected MLE)			0.114		
671	nu hat (MLE)			59.52			nu star (bias corrected)			55.44		
672	MLE Mean (bias corrected)			0.096			MLE Sd (bias corrected)			0.105		
673												
674						Gamma Kaplan-Meier (KM) Statistics						
675	k hat (KM)			7.4201E-4			nu hat (KM)			0.223		
676							Adjusted Level of Significance (β)			0.0484		
677	Approximate Chi Square Value (0.22, α)			0.144			Adjusted Chi Square Value (0.22, β)			0.0949		
678	95% Gamma Approximate KM-UCL (use when n>=50)			-0.00411			mma Adjusted KM-UCL (use when n<50)			-0.00626		
679	Gamma (KM) may not be used when k hat (KM) is < 0.1											
680												

	A	B	C	D	E	F	G	H	I	J	K	L
681						DL/2 Statistics						
682			Mean in Original Scale			0.0245			SD in Original Scale			0.0912
683			95% t UCL (Assumes normality)			0.0368						
684			DL/2 is not a recommended method, provided for comparisons and historical reasons									
685												
686						Nonparametric Distribution Free UCL Statistics						
687						Data do not follow a Discernible Distribution at 5% Significance Level						
688												
689						Suggested UCL to Use						
690			97.5% KM (Chebyshev) UCL			0.0482						
691												
692		Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL										
693		Recommendations are based upon data size, data distribution, and skewness.										
694		These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006)										
695		However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician										
696												
697	Selenium											
698												
699						General Statistics						
700			Total Number of Observations			150		Number of Distinct Observations				39
701			Number of Detects			126		Number of Non-Detects				24
702			Number of Distinct Detects			26		Number of Distinct Non-Detects				17
703			Minimum Detect			0.67		Minimum Non-Detect				0.21
704			Maximum Detect			1.9		Maximum Non-Detect				1.2
705			Variance Detects			0.0414		Percent Non-Detects				16%
706			Mean Detects			1.135		SD Detects				0.203
707			Median Detects			1.1		CV Detects				0.179
708			Skewness Detects			0.662		Kurtosis Detects				1.841
709			Mean of Logged Detects			0.111		SD of Logged Detects				0.178
710												
711						Normal GOF Test on Detects Only						
712			Shapiro Wilk Test Statistic			0.95		Normal GOF Test on Detected Observations Only				
713			5% Shapiro Wilk P Value			4.1380E-4		Detected Data Not Normal at 5% Significance Level				
714			Lilliefors Test Statistic			0.128		Lilliefors GOF Test				
715			5% Lilliefors Critical Value			0.0789		Detected Data Not Normal at 5% Significance Level				
716						Detected Data Not Normal at 5% Significance Level						
717												
718						Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs						
719			Mean			1.019		Standard Error of Mean				0.0313
720			SD			0.343		95% KM (BCA) UCL				1.075
721			95% KM (t) UCL			1.071		95% KM (Percentile Bootstrap) UCL				1.072
722			95% KM (z) UCL			1.071		95% KM Bootstrap t UCL				1.07
723			90% KM Chebyshev UCL			1.113		95% KM Chebyshev UCL				1.156
724			97.5% KM Chebyshev UCL			1.215		99% KM Chebyshev UCL				1.331
725												
726						Gamma GOF Tests on Detected Observations Only						
727			A-D Test Statistic			1.427		Anderson-Darling GOF Test				
728			5% A-D Critical Value			0.75		Detected Data Not Gamma Distributed at 5% Significance Level				
729			K-S Test Statistic			0.131		Kolmogrov-Smirnoff GOF				
730			5% K-S Critical Value			0.0825		Detected Data Not Gamma Distributed at 5% Significance Level				
731						Detected Data Not Gamma Distributed at 5% Significance Level						
732												
733						Gamma Statistics on Detected Data Only						
734			k hat (MLE)			32.08		k star (bias corrected MLE)				31.32
735			Theta hat (MLE)			0.0354		Theta star (bias corrected MLE)				0.0362
736			nu hat (MLE)			8085		nu star (bias corrected)				7894
737			MLE Mean (bias corrected)			1.135		MLE Sd (bias corrected)				0.203
738												
739						Gamma Kaplan-Meier (KM) Statistics						
740			k hat (KM)			8.823		nu hat (KM)				2647
741		Approximate Chi Square Value (N/A, α)				2528		Adjusted Chi Square Value (N/A, β)				2527
742		95% Gamma Approximate KM-UCL (use when n>=50)				1.067		mma Adjusted KM-UCL (use when n<50)				1.067
743												
744						Gamma ROS Statistics using Imputed Non-Detects						
745		GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs										
746		GROS may not be used when kstar of detected data is small such as < 0.1										
747		For such situations, GROS method tends to yield inflated values of UCLs and BTVs										
748		For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates										
749			Minimum			0.654		Mean				1.077
750			Maximum			1.9		Median				1.1
751			SD			0.231		CV				0.215
752			k hat (MLE)			21.9		k star (bias corrected MLE)				21.46
753			Theta hat (MLE)			0.0492		Theta star (bias corrected MLE)				0.0502
754			nu hat (MLE)			6569		nu star (bias corrected)				6439
755			MLE Mean (bias corrected)			1.077		MLE Sd (bias corrected)				0.232
756								Adjusted Level of Significance (β)				0.0484
757		Approximate Chi Square Value (N/A, α)				6253		Adjusted Chi Square Value (N/A, β)				6251
758		95% Gamma Approximate UCL (use when n>=50)				1.109		Gamma Adjusted UCL (use when n<50)				1.109
759												
760						Lognormal GOF Test on Detected Observations Only						
761			Lilliefors Test Statistic			0.14		Lilliefors GOF Test				
762			5% Lilliefors Critical Value			0.0789		Detected Data Not Lognormal at 5% Significance Level				
763						Detected Data appear Approximate Lognormal at 5% Significance Level						
764												
765						Lognormal ROS Statistics Using Imputed Non-Detects						

	A	B	C	D	E	F	G	H	I	J	K	L
766					Mean in Original Scale	1.08				Mean in Log Scale		0.0549
767					SD in Original Scale	0.227				SD in Log Scale		0.21
768			95% t UCL (assumes normality of ROS data)			1.11				95% Percentile Bootstrap UCL		1.11
769				95% BCA Bootstrap UCL		1.107				95% Bootstrap t UCL		1.11
770				95% H-UCL (Log ROS)		1.112						
771												
772			**UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed**									
773				KM Mean (logged)		-0.083				95% H-UCL (KM -Log)		1.152
774				KM SD (logged)		0.536				95% Critical H Value (KM-Log)		1.852
775			KM Standard Error of Mean (logged)			0.0555						
776												
777						**DL/2 Statistics**						
778			**DL/2 Normal**						**DL/2 Log-Transformed**			
779				Mean in Original Scale		1.014				Mean in Log Scale		-0.0761
780				SD in Original Scale		0.339				SD in Log Scale		0.495
781			95% t UCL (Assumes normality)			1.059				95% H-Stat UCL		1.128
782			**DL/2 is not a recommended method, provided for comparisons and historical reasons**									
783												
784						**Nonparametric Distribution Free UCL Statistics**						
785						**Detected Data appear Approximate Lognormal Distributed at 5% Significance Level**						
786												
787						**Suggested UCL to Use**						
788				95% KM (BCA) UCL		1.075						
789												
790			Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL										
791			Recommendations are based upon data size, data distribution, and skewness.									
792			These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006)										
793			However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician										
794												
795	Silver											
796												
797						**General Statistics**						
798			Total Number of Observations			150			Number of Distinct Observations			78
799				Number of Detects		95				Number of Non-Detects		55
800			Number of Distinct Detects			60			Number of Distinct Non-Detects			20
801				Minimum Detect		0.028				Minimum Non-Detect		0.22
802				Maximum Detect		11.6				Maximum Non-Detect		1.6
803				Variance Detects		1.452				Percent Non-Detects		36.67%
804				Mean Detects		0.273				SD Detects		1.205
805				Median Detects		0.07				CV Detects		4.412
806				Skewness Detects		9.064				Kurtosis Detects		85.44
807			Mean of Logged Detects			-2.337				SD of Logged Detects		0.965
808												
809						**Normal GOF Test on Detects Only**						
810			Shapiro Wilk Test Statistic			0.192			**Normal GOF Test on Detected Observations Only**			
811			5% Shapiro Wilk P Value			0			Detected Data Not Normal at 5% Significance Level			
812			Lilliefors Test Statistic			0.421			**Lilliefors GOF Test**			
813			5% Lilliefors Critical Value			0.0909			Detected Data Not Normal at 5% Significance Level			
814						**Detected Data Not Normal at 5% Significance Level**						
815												
816					**Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs**							
817					Mean	0.211				Standard Error of Mean		0.0789
818					SD	0.959				95% KM (BCA) UCL		0.373
819				95% KM (t) UCL		0.342			95% KM (Percentile Bootstrap) UCL			0.364
820				95% KM (z) UCL		0.341				95% KM Bootstrap t UCL		0.782
821				90% KM Chebyshev UCL		0.448				95% KM Chebyshev UCL		0.555
822				97.5% KM Chebyshev UCL		0.704				99% KM Chebyshev UCL		0.996
823												
824						**Gamma GOF Tests on Detected Observations Only**						
825				A-D Test Statistic		13.97			**Anderson-Darling GOF Test**			
826				5% A-D Critical Value		0.809			Detected Data Not Gamma Distributed at 5% Significance Level			
827				K-S Test Statistic		0.26			**Kolmogrov-Smirnoff GOF**			
828				5% K-S Critical Value		0.0965			Detected Data Not Gamma Distributed at 5% Significance Level			
829						**Detected Data Not Gamma Distributed at 5% Significance Level**						
830												
831						**Gamma Statistics on Detected Data Only**						
832				k hat (MLE)		0.595				k star (bias corrected MLE)		0.584
833				Theta hat (MLE)		0.459				Theta star (bias corrected MLE)		0.468
834				nu hat (MLE)		113.1				nu star (bias corrected)		110.9
835			MLE Mean (bias corrected)			0.273				MLE Sd (bias corrected)		0.358
836												
837						**Gamma Kaplan-Meier (KM) Statistics**						
838				k hat (KM)		0.0484				nu hat (KM)		14.53
839			Approximate Chi Square Value (14.53, α)			6.934			Adjusted Chi Square Value (14.53, β)			6.883
840			95% Gamma Approximate KM-UCL (use when n>=50)			0.442		Gamma Adjusted KM-UCL (use when n<50)				0.445
841						**Gamma (KM) may not be used when k hat (KM) is < 0.1**						
842												
843						**Gamma ROS Statistics using Imputed Non-Detects**						
844			GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs										
845			GROS may not be used when kstar of detected data is small such as < 0.1										
846			For such situations, GROS method tends to yield inflated values of UCLs and BTVs										
847			For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates										
848					Minimum	0.01				Mean		0.221
849					Maximum	11.6				Median		0.061
850					SD	0.969				CV		4.374

	A	B	C	D	E	F	G	H	I	J	K	L
851						k hat (MLE)	0.512			k star (bias corrected MLE)		0.506
852						Theta hat (MLE)	0.433			Theta star (bias corrected MLE)		0.438
853						nu hat (MLE)	153.5			nu star (bias corrected)		151.8
854			MLE Mean (bias corrected)				0.221			MLE Sd (bias corrected)		0.311
855										Adjusted Level of Significance (β)		0.0484
856		Approximate Chi Square Value (151.77, α)					124.3			Adjusted Chi Square Value (151.77, β)		124.1
857		95% Gamma Approximate UCL (use when n>=50)					0.27		Gamma Adjusted UCL (use when n<50)			0.271
858												
859						Lognormal GOF Test on Detected Observations Only						
860			Lilliefors Test Statistic				0.188			Lilliefors GOF Test		
861			5% Lilliefors Critical Value				0.0909		Detected Data Not Lognormal at 5% Significance Level			
862					Detected Data Not Lognormal at 5% Significance Level							
863												
864						Lognormal ROS Statistics Using Imputed Non-Detects						
865			Mean in Original Scale				0.21			Mean in Log Scale		-2.371
866			SD in Original Scale				0.961			SD in Log Scale		0.826
867		95% t UCL (assumes normality of ROS data)					0.339		95% Percentile Bootstrap UCL			0.36
868			95% BCA Bootstrap UCL				0.523			95% Bootstrap t UCL		0.897
869			95% H-UCL (Log ROS)				0.151					
870												
871						DL/2 Statistics						
872			DL/2 Normal							DL/2 Log-Transformed		
873			Mean in Original Scale				0.297			Mean in Log Scale		-1.917
874			SD in Original Scale				0.964			SD in Log Scale		0.983
875		95% t UCL (Assumes normality)					0.427			95% H-Stat UCL		0.284
876			DL/2 is not a recommended method, provided for comparisons and historical reasons									
877												
878						Nonparametric Distribution Free UCL Statistics						
879					Data do not follow a Discernible Distribution at 5% Significance Level							
880												
881						Suggested UCL to Use						
882			95% KM (BCA) UCL				0.373					
883												
884		Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL										
885				Recommendations are based upon data size, data distribution, and skewness.								
886			These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006)									
887		However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician										
888												
889												
890	Uranium											
891												
892						General Statistics						
893		Total Number of Observations				20			Number of Distinct Observations			20
894									Number of Missing Observations			0
895					Minimum		1.59				Mean	3.632
896					Maximum		10.7				Median	2.5
897					SD		2.668			Std. Error of Mean		0.597
898			Coefficient of Variation				0.735				Skewness	1.635
899												
900						Normal GOF Test						
901			Shapiro Wilk Test Statistic				0.733			Shapiro Wilk GOF Test		
902		5% Shapiro Wilk Critical Value					0.905		Data Not Normal at 5% Significance Level			
903			Lilliefors Test Statistic				0.267			Lilliefors GOF Test		
904			5% Lilliefors Critical Value				0.198		Data Not Normal at 5% Significance Level			
905					Data Not Normal at 5% Significance Level							
906												
907						Assuming Normal Distribution						
908			95% Normal UCL							95% UCLs (Adjusted for Skewness)		
909			95% Student's-t UCL				4.663		95% Adjusted-CLT UCL (Chen-1995)			4.846
910									95% Modified-t UCL (Johnson-1978)			4.7
911												
912						Gamma GOF Test						
913			A-D Test Statistic				1.532			Anderson-Darling Gamma GOF Test		
914			5% A-D Critical Value				0.749		Data Not Gamma Distributed at 5% Significance Level			
915			K-S Test Statistic				0.229			Kolmogrov-Smirnoff Gamma GOF Test		
916			5% K-S Critical Value				0.195		Data Not Gamma Distributed at 5% Significance Level			
917					Data Not Gamma Distributed at 5% Significance Level							
918												
919						Gamma Statistics						
920			k hat (MLE)				2.757			k star (bias corrected MLE)		2.377
921			Theta hat (MLE)				1.317			Theta star (bias corrected MLE)		1.528
922			nu hat (MLE)				110.3			nu star (bias corrected)		95.07
923			MLE Mean (bias corrected)				3.632			MLE Sd (bias corrected)		2.356
924									Approximate Chi Square Value (0.05)			73.59
925			Adjusted Level of Significance				0.038			Adjusted Chi Square Value		72.09
926												
927						Assuming Gamma Distribution						
928		95% Approximate Gamma UCL (use when n>=50))					4.692		Adjusted Gamma UCL (use when n<50)			4.789
929												
930						Lognormal GOF Test						
931			Shapiro Wilk Test Statistic				0.855			Shapiro Wilk Lognormal GOF Test		
932		5% Shapiro Wilk Critical Value					0.905		Data Not Lognormal at 5% Significance Level			
933			Lilliefors Test Statistic				0.2			Lilliefors Lognormal GOF Test		
934			5% Lilliefors Critical Value				0.198		Data Not Lognormal at 5% Significance Level			
935					Data Not Lognormal at 5% Significance Level							

	A	B	C	D	E	F	G	H	I	J	K	L
936												
937						Lognormal Statistics						
938			Minimum of Logged Data			0.464			Mean of logged Data			1.097
939			Maximum of Logged Data			2.37			SD of logged Data			0.592
940												
941						Assuming Lognormal Distribution						
942				95% H-UCL		4.756			90% Chebyshev (MVUE) UCL			5.007
943			95% Chebyshev (MVUE) UCL			5.674			97.5% Chebyshev (MVUE) UCL			6.6
944			99% Chebyshev (MVUE) UCL			8.418						
945												
946						Nonparametric Distribution Free UCL Statistics						
947						Data do not follow a Discernible Distribution (0.05)						
948												
949						Nonparametric Distribution Free UCLs						
950				95% CLT UCL		4.613			95% Jackknife UCL			4.663
951			95% Standard Bootstrap UCL			4.62			95% Bootstrap-t UCL			5.124
952			95% Hall's Bootstrap UCL			4.627			95% Percentile Bootstrap UCL			4.588
953			95% BCA Bootstrap UCL			4.801						
954			90% Chebyshev(Mean, Sd) UCL			5.422			95% Chebyshev(Mean, Sd) UCL			6.232
955			97.5% Chebyshev(Mean, Sd) UCL			7.358			99% Chebyshev(Mean, Sd) UCL			9.568
956												
957						Suggested UCL to Use						
958			95% Chebyshev (Mean, Sd) UCL			6.232						
959												
960		Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL										
961		These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)										
962		and Singh and Singh (2003). However, simulations results will not cover all Real World data sets										
963		For additional insight the user may want to consult a statistician.										
964												
965	Zinc											
966												
967						General Statistics						
968			Total Number of Observations			150			Number of Distinct Observations			120
969									Number of Missing Observations			0
970				Minimum		12.3			Mean			47.78
971				Maximum		812			Median			32.3
972				SD		77.24			Std. Error of Mean			6.307
973			Coefficient of Variation			1.617			Skewness			7.734
974												
975						Normal GOF Test						
976			Shapiro Wilk Test Statistic			0.328			Shapiro Wilk GOF Test			
977			5% Shapiro Wilk P Value			0			Data Not Normal at 5% Significance Level			
978			Lilliefors Test Statistic			0.325			Lilliefors GOF Test			
979			5% Lilliefors Critical Value			0.0723			Data Not Normal at 5% Significance Level			
980						Data Not Normal at 5% Significance Level						
981												
982						Assuming Normal Distribution						
983				95% Normal UCL					95% UCLs (Adjusted for Skewness)			
984			95% Student's-t UCL			58.22			95% Adjusted-CLT UCL (Chen-1995)			62.41
985									95% Modified-t UCL (Johnson-1978)			58.88
986												
987						Gamma GOF Test						
988			A-D Test Statistic			15.84			Anderson-Darling Gamma GOF Test			
989			5% A-D Critical Value			0.767			Data Not Gamma Distributed at 5% Significance Level			
990			K-S Test Statistic			0.282			Kolmogrov-Smirnoff Gamma GOF Test			
991			5% K-S Critical Value			0.0777			Data Not Gamma Distributed at 5% Significance Level			
992						Data Not Gamma Distributed at 5% Significance Level						
993												
994						Gamma Statistics						
995			k hat (MLE)			1.888			k star (bias corrected MLE)			1.855
996			Theta hat (MLE)			25.3			Theta star (bias corrected MLE)			25.76
997			nu hat (MLE)			566.5			nu star (bias corrected)			556.5
998			MLE Mean (bias corrected)			47.78			MLE Sd (bias corrected)			35.08
999									Approximate Chi Square Value (0.05)			502.8
1000			Adjusted Level of Significance			0.0484			Adjusted Chi Square Value			502.3
1001												
1002						Assuming Gamma Distribution						
1003		95% Approximate Gamma UCL (use when n>=50))				52.88		% Adjusted Gamma UCL (use when n<50)				52.93
1004												
1005						Lognormal GOF Test						
1006			Shapiro Wilk Test Statistic			0.821			Shapiro Wilk Lognormal GOF Test			
1007			5% Shapiro Wilk P Value			0			Data Not Lognormal at 5% Significance Level			
1008			Lilliefors Test Statistic			0.219			Lilliefors Lognormal GOF Test			
1009			5% Lilliefors Critical Value			0.0723			Data Not Lognormal at 5% Significance Level			
1010						Data Not Lognormal at 5% Significance Level						
1011												
1012						Lognormal Statistics						
1013			Minimum of Logged Data			2.51			Mean of logged Data			3.579
1014			Maximum of Logged Data			6.7			SD of logged Data			0.581
1015												
1016						Assuming Lognormal Distribution						
1017				95% H-UCL		46.38			90% Chebyshev (MVUE) UCL			48.84
1018			95% Chebyshev (MVUE) UCL			51.78			97.5% Chebyshev (MVUE) UCL			55.85
1019			99% Chebyshev (MVUE) UCL			63.86						
1020												

	A	B	C	D	E	F	G	H	I	J	K	L
1021	Nonparametric Distribution Free UCL Statistics											
1022	Data do not follow a Discernible Distribution (0.05)											
1023												
1024	Nonparametric Distribution Free UCLs											
1025	95% CLT UCL					58.15	95% Jackknife UCL					58.22
1026	95% Standard Bootstrap UCL					58.22	95% Bootstrap-t UCL					74.01
1027	95% Hall's Bootstrap UCL					100.6	95% Percentile Bootstrap UCL					59.05
1028	95% BCA Bootstrap UCL					63.68						
1029	90% Chebyshev(Mean, Sd) UCL					66.7	95% Chebyshev(Mean, Sd) UCL					75.27
1030	97.5% Chebyshev(Mean, Sd) UCL					87.17	99% Chebyshev(Mean, Sd) UCL					110.5
1031												
1032	Suggested UCL to Use											
1033	95% Chebyshev (Mean, Sd) UCL					75.27						
1034												
1035	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL											
1036	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
1037	and Singh and Singh (2003). However, simulations results will not cover all Real World data sets											
1038	For additional insight the user may want to consult a statistician.											
1039												