UCL Calculator v 1.0

Kenneth Portier
Associate Professor of Statistics
University of Florida

Exposure Point Concentration

A key element of the risk assessment process for suspected contaminated sites is the estimation of the concentration of chemicals of concern in various environmental media. This concentration is commonly referred to as the exposure point concentration or EPC.

The EPC is typically a conservative estimate of the average chemical concentration.

The “conservative estimate” commonly used is the upper limit of a one-sided 95% confidence interval for the concentration mean.

- Need a method of estimating the concentration mean.
- Need a method of computing the one-sided 95% confidence interval.

Calculating the Concentration Term for a Risk Assessment

EPA, 2002, Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites, Office of Emergency and Remedial Response, US EPA, Washington, DC. OSWER 9285.6-10, December 2002.

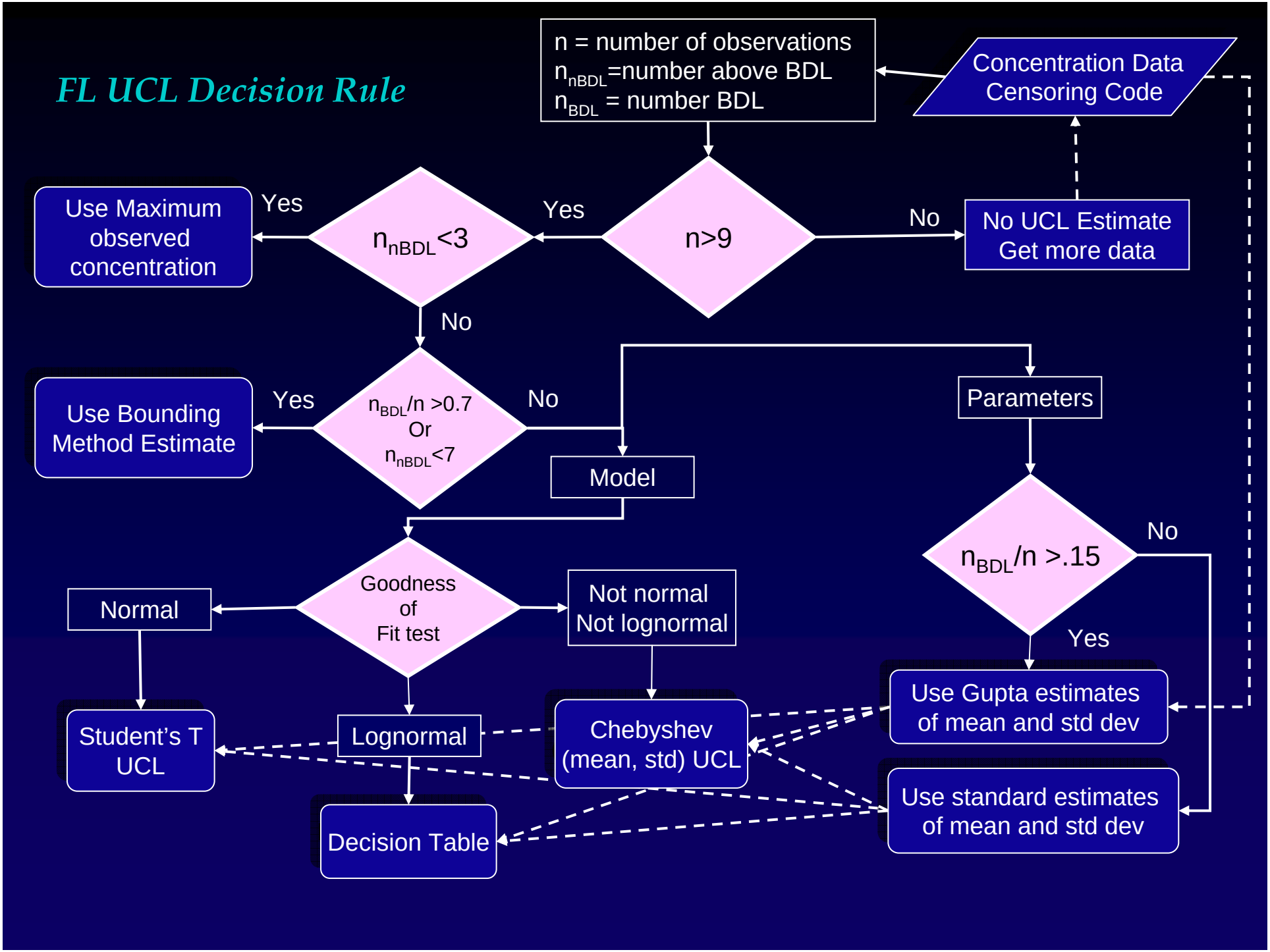
Discussion of all the issues (non-detects, non-normal distributions, etc) – Recommendation for the use of different methods.

EPA Recommendations are implemented in PROUCL v3. But PROUCL v 3 does not provide methods to handle BDL (censored) data.

UCL Calculator version 1.0 (Fl UCL) implements most of the EPA 2002 recommendations but does provide methods of estimating with BDL data.

What is the Florida UCL Calculator?

- An Excel Add-In tool that implements a set of decision rules to aid risk assessors in the appropriate selection and computation of the 95% UCL for a set of concentration data.
- The UCL Calculator decision protocol is designed to:
  - » Yield a 95% UCL estimate that is closest among all methods to the true mean while continuing to provide 95% coverage probability.
  - » Use state of the science estimation methods to handle below detection limit data.
  - » Use state of the science tests of distributions on data containing below detection limit data.
  - » Choose the method based on sample size, coefficient of variation, underlying distribution and degree of censoring.


FL UCL Decision Rule
n = number of observations
n_{nBDL}=number above BDL
n_{BDL} = number BDL
Concentration Data
Censoring Code
n>9
No
No UCL Estimate
Get more data
Yes
n_{nBDL}<3
Yes
Use Maximum
observed
concentration
No
n_{BDL}/n >0.7
Or
n_{nBDL}<7
Yes
Use Bounding
Method Estimate
No
Model
Parameters
n_{BDL}/n >.15
No
Yes
Goodness
of
Fit test
Normal
Not normal
Not lognormal
Use Gupta estimates
of mean and std dev
Student's T
UCL
Lognormal
Chebyshev
(mean, std) UCL
Use standard estimates
of mean and std dev
Decision Table

Lognormal Data Decision Table

	Number of Observations			
CV	**10-14**	**15-24**	**25-50**	**50+**
0 - 0.25	Method A			
0.25 – 1.25	Method B		Method C	
1.25 - 1.80	Method C			
1.80 – 2.00			Method D	
2.00 – 2.20	Method C			
>2.20	Method D			

Method A – UCL estimated using the 95% Chebychev (MVUE) method.

Method B – UCL estimated as the minimum of 1) EPA H-statistic UCL, and 2) 95% Chebychev (MVUE) UCL.

Method C – UCL estimated as the minimum of 1) EPA H-statistic UCL, 2) 95% Chebychev (MVUE) UCL, and 3) 95% Chebychev (sample mean, sample standard deviation) UCL.

Method D – UCL estimated as the minimum of 1) EPA H-statistic UCL, 2) 95% Chebychev (MVUE) UCL, 3) 95% Chebychev (sample mean, sample standard deviation) UCL and 4) the Central Limit Theorem UCL

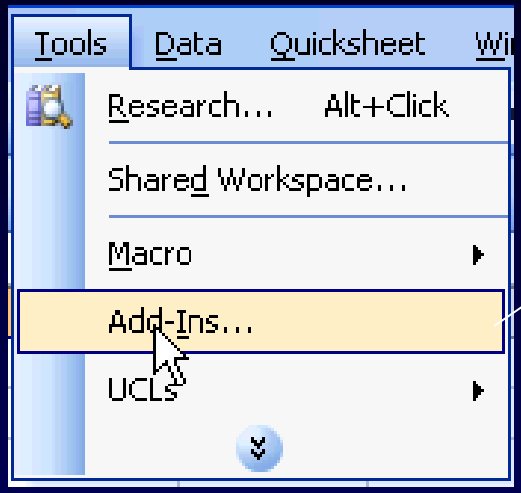
How is UCL Calculator v 1.0 different from UCL Calculator v 0.96

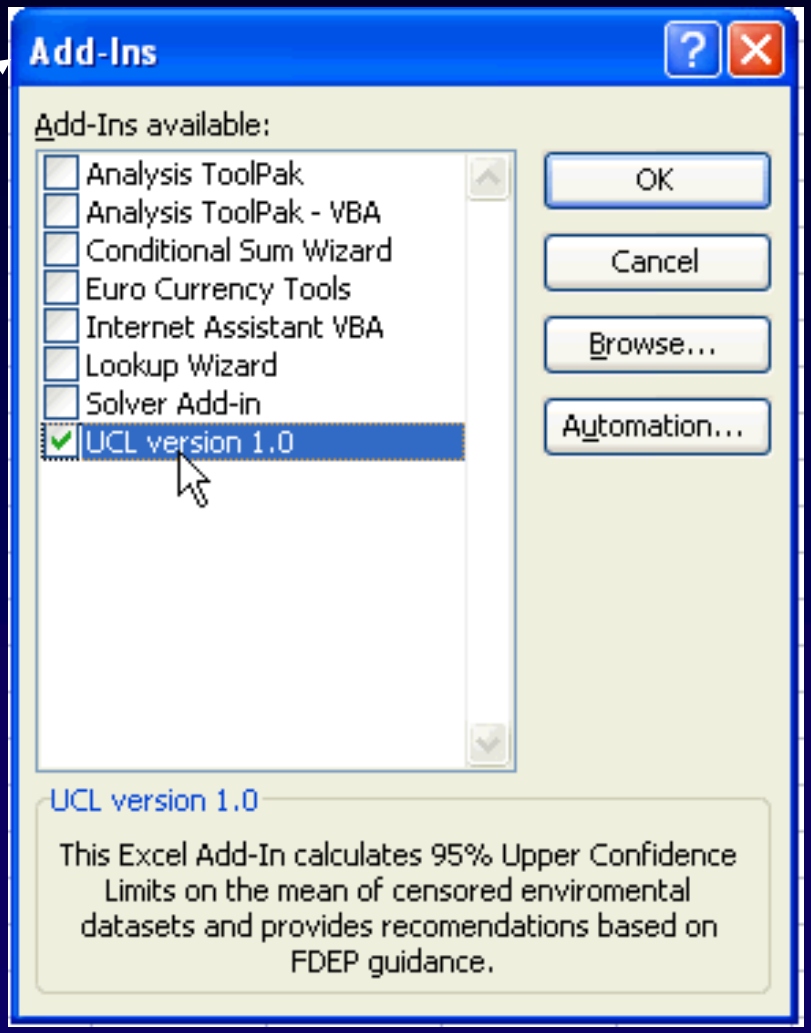
- Additional software help provided from Help item on Menu bar.
  - Technical help.
  - Sample size issues help.
  - Developers and contacts help.
- Indicates when the maximum observed concentration might be acceptable as an estimate for the Exposure Point Concentration.
- Incorporates best recommendations for providing an estimate for the Exposure Point Concentration in the situation where there are many samples but few detectable observations.

What UCL Calculator v 1.0 Does Not Do!

- Will not make recommendations when there are too few observations (total observations less than 10).
- Will not make recommendations when the number of observations that are greater than detection is too few (the actual number depends on the total sample size with fewer needed with larger sample sizes but at a minimum you need 3 observations above DL).
- Does not test for the Gamma distribution, nor does it use the Gamma based 95% UCL (a feature incorporated in ProUCL 2004).

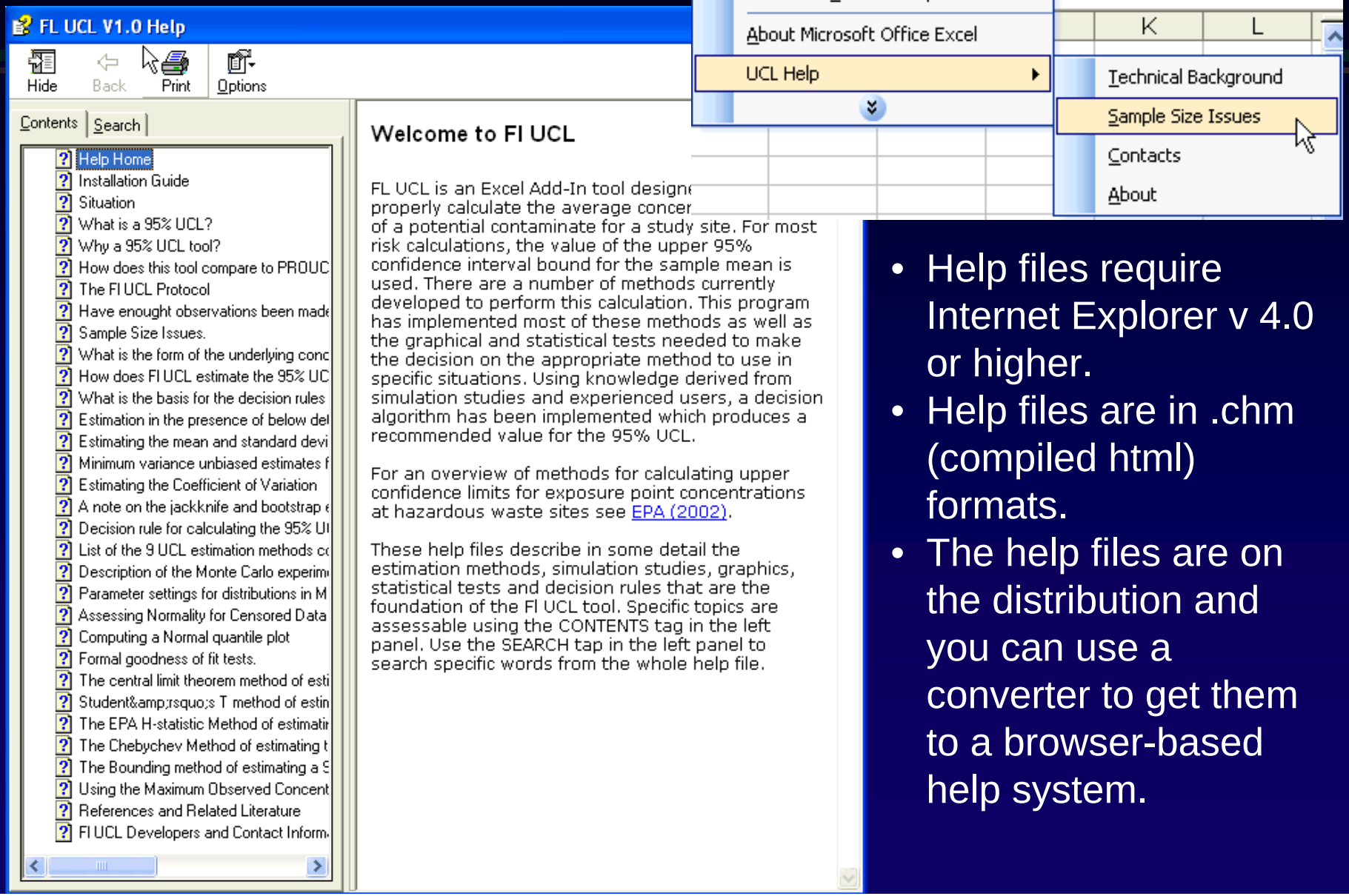
Enabling the Add-In





If installation is successful, UCL version 1.0 will show up as an available Add-In.

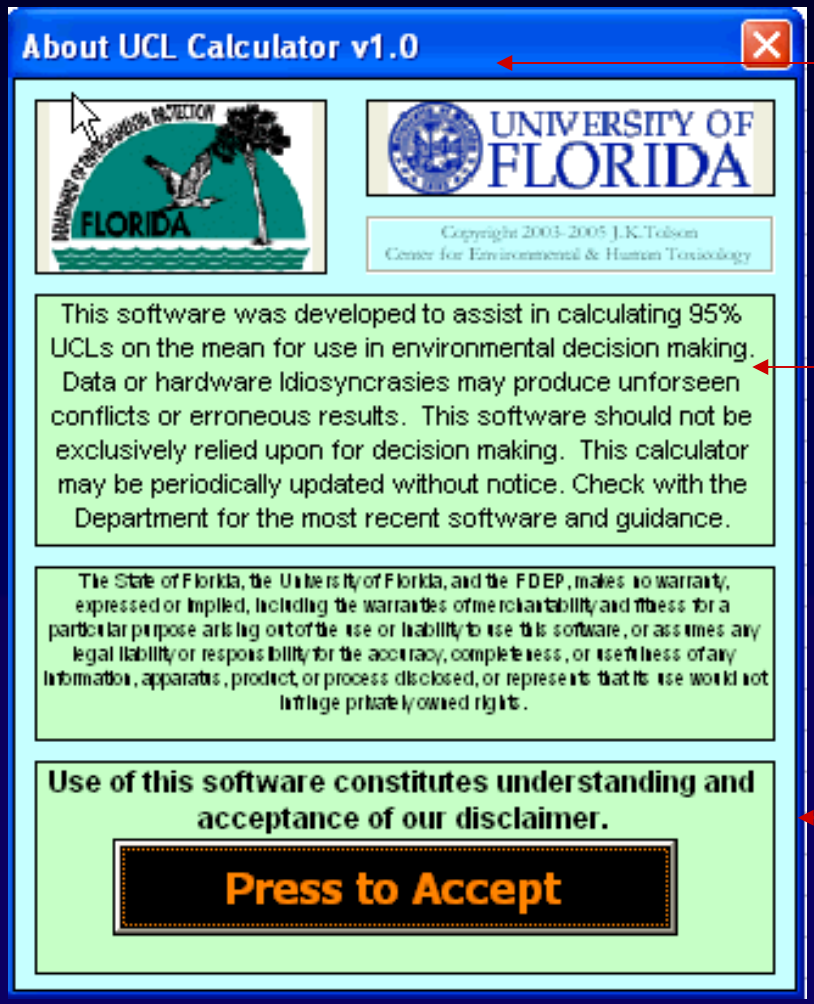
Assessing Help



- Help files require Internet Explorer v 4.0 or higher.
- Help files are in .chm (compiled html) formats.
- The help files are on the distribution and you can use a converter to get them to a browser-based help system.

Should see only once.

About Screen

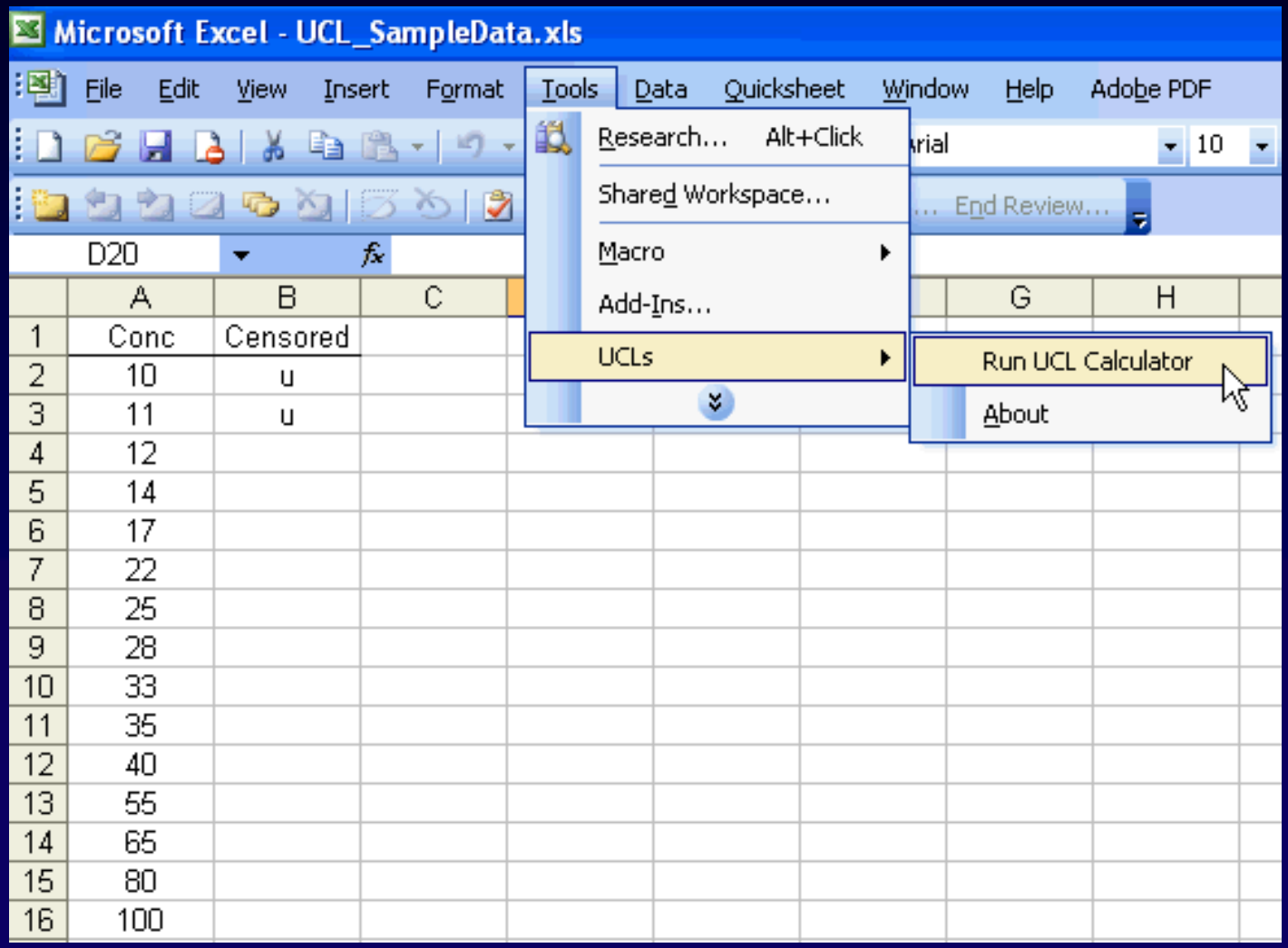


Version: 1.0

Disclaimers

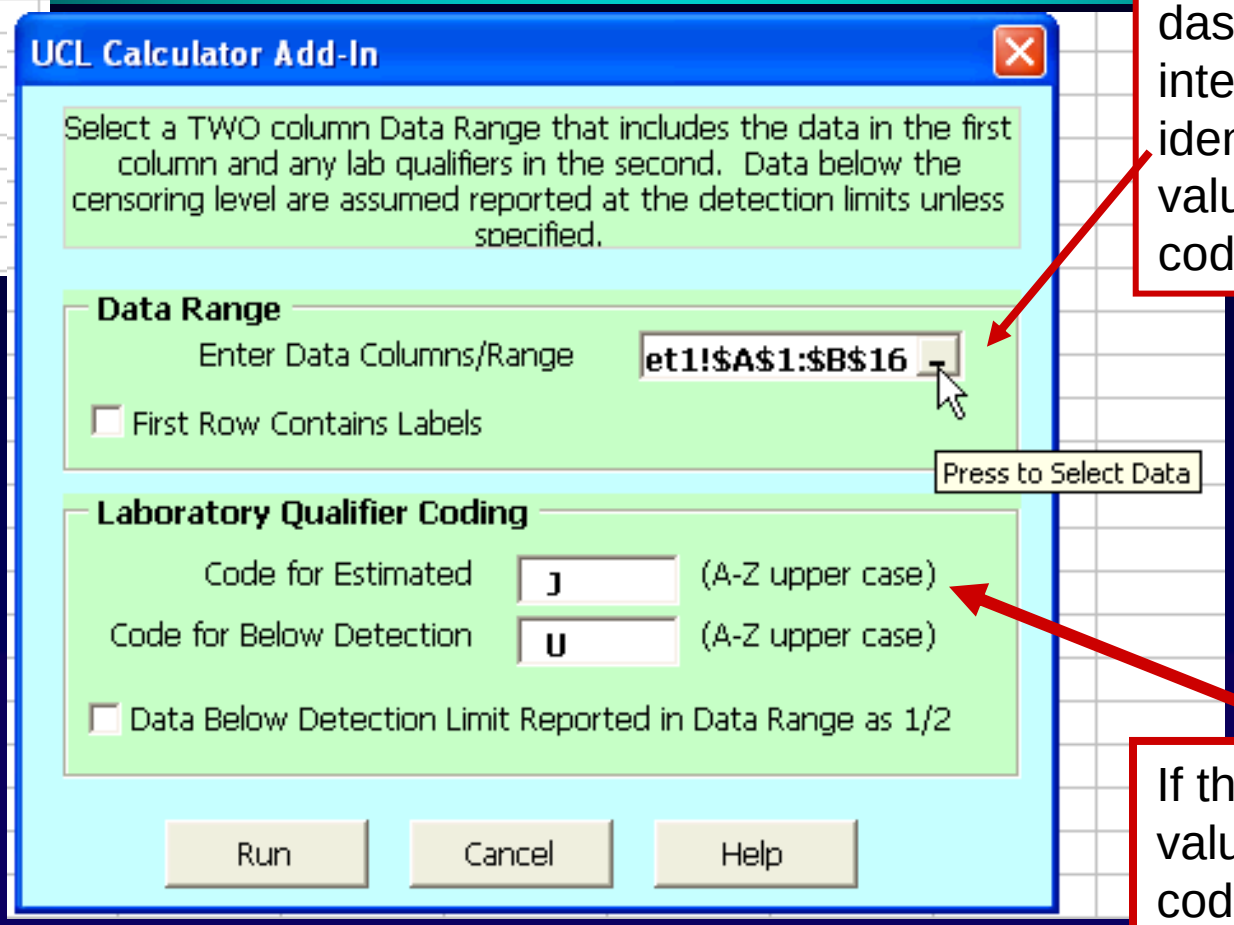
Read and proceed

Run the UCL Calculator



Identifying Data

	A	B
1	Conc	Censored
2	10	u
3	11	u
4	12	
5	14	
6	17	
7	22	
8	25	
9	28	
10	33	
11	35	
12	40	
13	55	
14	65	
15	80	
16	100	



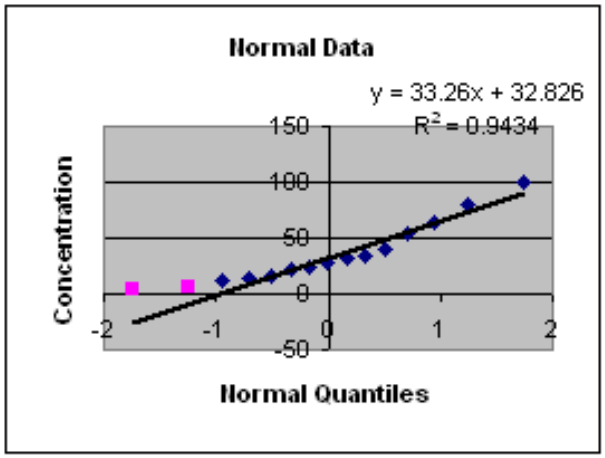
Click on the dash to enable interactive identification of values and codes

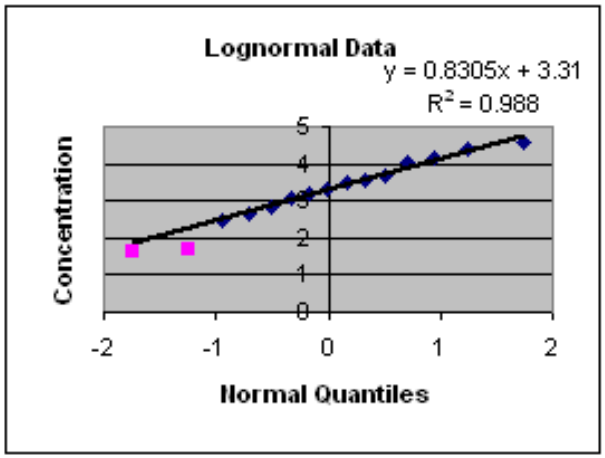
If there are BDL values, what is the code used in the censored data column.

Goodness of Fit Test Results

FDEP UCL Calculator Version 1.0

Goodness-of-fit test results





Shapiro-Francia Results (Adjust for Censoring)

SF for Normal Distribution	0.9434
SF for LogNormal Distribution	0.988
Shapiro-Francia critical value for p<0.05	0.94049

Test stat > critical value indicates a reasonable fit

Shapiro-Wilk's Test Results for All Data (BDL replaced with 1/2 DL)

SW test statistic for Normal Distribution	0.896
SW test statistic for LogNormal Distribution	0.963
Shapiro-Wilk's critical value for p<0.05	0.881

Test stat > critical value indicates a reasonable fit

Based on the results of the Shapiro-Wilk's test Distribution is best described as: Lognormal

Lognormal

Estimates Worksheet

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Summary Statistics for	
Number of Samples	15
Number of Censored Data	2
Minimum	5
Maximum	100
Mean	35.76667
Median	28
Standard Deviation	27.96992
Variance	782.3167
Coefficient of Variation	0.782011
Skewness	1.100581

95% UCL (Assuming Normal Data)	
Student's-t	48.4865

95% UCL (Adjusted for Skewness)	
Adjusted-CLT	49.83968
Modified-t	48.82854

95% Non-parametric UCL	
CLT	47.64653
Jackknife	NA
Standard Bootstrap	46.6317
Bootstrap-t	55.17154
Chebyshev (Mean, Std)	67.24651

Summary Statistics for ln()	
Minimum	1.609438
Maximum	4.60517
Mean	3.254876
Standard Deviation	0.891902
Variance	0.795489

Goodness-of-Fit Results	
Distribution Recommended	Lognormal
Distribution Used	Lognormal

Estimates Assuming Lognormal Distribution	
MLE Mean	38.57562
MLE Standard Deviation	42.52995
MLE Median	25.9164
MLE Coefficient of Variation	1.102508
MVUE Estimate of Mean	37.075
MVUE Estimate of Std. Dev.	35.9878
MVUE Estimate of SE	9.785651
MVUE Coefficient of Variation	0.970675

UCL Assuming Lognormal Distribution	
95% H-UCL	72.9737
95% Chebyshev (MVUE) UCL	79.72968
99% Chebyshev (MVUE) UCL	134.4413

FDEP Recommended UCL to Use:
72.9737

What is displayed will change with datasets and distributional assumptions.

Header Note.

High degree of censoring.

Bounding Method

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Note: Bounding estimates are worst case 95% UCLs based on the Chebyshev (mean, std) method.

Summary Statistics for	
Number of Samples	37
Number of Censored Data	29
Minimum	0.8
Maximum	45
Mean	3.516216
Median	0.6
Standard Deviation	9.251171
Variance	
Coefficient of Variation	2.631002
Skewness	3.619367

95% UCL (Assuming Normal Data)	
Student's-t	NA

95% UCL (Adjusted for Skewness)	
Adjusted-CLT	NA
Modified-t	NA

95% Non-parametric UCL	
CLT	NA
Jackknife	NA
Standard Bootstrap	NA
Bootstrap-t	NA
Chebyshev (Mean, Std)	NA

95% Bounding Method UCL	
Bounding (Max)	10.14559
Bounding (1/2 DL)	9.98175

Summary Statistics for	
Minimum	NA
Maximum	NA
Mean	NA
Standard Deviation	NA
Variance	NA

Goodness-of-Fit Results	
Distribution Recommended	NA
Distribution Used	Neither

Estimates Assuming Lognormal Distribution	
MLE Mean	NA
MLE Standard Deviation	NA
MLE Median	NA
MLE Coefficient of Variation	NA
MVUE Estimate of Mean	NA
MVUE Estimate of Std. Dev.	NA
MVUE Estimate of SE	NA
MVUE Coefficient of Variation	NA

UCL Assuming Lognormal Distribution	
95% H-UCL	NA
95% Chebyshev (MVUE) UCL	NA
99% Chebyshev (MVUE) UCL	NA

FDEP Recommended UCL to Use:
10.14559

Note

Max Concentration

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Note: Too few observations available to compute UCLs - Use Maximum.

Summary Statistics for	
Number of Samples	37
Number of Censored Data	35
Minimum	32
Maximum	45
Mean	3.516216
Median	0.6
Standard Deviation	9.251171
Variance	
Coefficient of Variation	2.631002
Skewness	3.619367

95% UCL (Assuming Normal Data)	
Student's-t	NA

95% UCL (Adjusted for Skewness)	
Adjusted-CLT	NA
Modified-t	NA

95% Non-parametric UCL	
CLT	NA
Jackknife	NA
Standard Bootstrap	NA
Bootstrap-t	NA
Chebyshev (Mean, Std)	NA

Summary Statistics for	
Minimum	NA
Maximum	NA
Mean	NA
Standard Deviation	NA
Variance	NA

Goodness-of-Fit Results	
Distribution Recommended	NA
Distribution Used	Neither

Estimates Assuming Lognormal Distribution	
MLE Mean	NA
MLE Standard Deviation	NA
MLE Median	NA
MLE Coefficient of Variation	NA
MVUE Estimate of Mean	NA
MVUE Estimate of Std. Dev.	NA
MVUE Estimate of SE	NA
MVUE Coefficient of Variation	NA

UCL Assuming Lognormal Distribution	
95% H-UCL	NA
95% Chebyshev (MVUE) UCL	NA
99% Chebyshev (MVUE) UCL	NA

FDEP Recommended UCL to Use:
45