# Model definitions

The log-logistic models are the most commonly used models.

### LL.2 two paramater log-logistic (// as parameter) with lower limit at 0 and upper limit at 1

$$ \LARGE{f(x) = \frac{1}{1+(\frac{x}{a})^b}} $$

### LL.3 three parameter log-logistic (// as parameter) with lower limit at 0

$$ \LARGE{f(x) = 0 + \frac{d - 0}{1+(\frac{x}{a})^b}} $$

### LL.3u three parameter log-logistic (// as parameter) with upper limit at 1

$$ \LARGE{f(x) = c + \frac{1-c}{1+(\frac{x}{a})^b}} $$

### LL.4 four paramater log-logistic (// as parameter)

$$ \LARGE{f(x) = c + \frac{d-c}{1+(\frac{x}{a})^b}} $$

### LL.5 Generalized log-logistic (// as parameter)

$$ \LARGE{f(x) = c + \frac{d-c}{[1+(\frac{x}{a})^b]^f}} $$

### LN.2 - two parameter log-normal

$$ \LARGE{f(x) = \Phi(\log(\frac{x}{a})^b)} $$

### LN.3 - three parameter log-normal

$$ \LARGE{f(x) = 0 + (d - 0) \* \Phi(\log(\frac{x}{a})^b)} $$

### LN.3u - three parameter log-normal with upper limit at 1

$$ \LARGE{f(x) = c + (1 - c) \* \Phi(\log(\frac{x}{a})^b)} $$

### LN.4 - four parameter log-normal

$$ \LARGE{f(x) = c + (d-c) \* \Phi(\log(\frac{x}{a})^b)} $$

### W1.2 two paramater Weibull model

$$ \LARGE{f(x) = \frac{1}{e^{(\frac{x}{a})^b}}} $$

### W1.3 three paramater Weibull model

$$ \LARGE{f(x) = 0 + \frac{d - 0}{e^{(\frac{x}{a})^b}}} $$

### W1.3u three paramater Weibull model with upper limit of 1

$$ \LARGE{f(x) = 0 + \frac{1 - 0}{e^{(\frac{x}{a})^b}}} $$

### W1.4 four paramater Weibull model with upper limit of 1

$$ \LARGE{f(x) = c + \frac{d - c}{e^{(\frac{x}{a})^b}}} $$

### W2.2 two paramater Weibull model

$$ \LARGE{f(x) = 1 - \frac{1}{e^{(\frac{x}{a})^b}}} $$

### W2.3 three paramater Weibull model

$$ \LARGE{f(x) = 0 + (d-0 )(1 - \frac{1}{e^{(\frac{x}{a})^b}})} $$

### W2.3u three paramater Weibull model with upper limit of 1

$$ \LARGE{f(x) = c + (1-c)(1 - \frac{1}{e^{(\frac{x}{a})^b}})} $$

### W2.4 four paramater Weibull model with upper limit of 1

$$ \LARGE{f(x) = c + (d-c)(\frac{d - c}{e^{(\frac{x}{a})^b}})} $$

##### Key:

x - concentration (in ppb)

a - the point of inflection (i.e. the point on the S-shaped curve halfway between c and d)

b - Hill’s slope of the curve (i.e. this is related to the steepness of the curve at point a)

c - the lower horizontal asymptote

d - the upper horizontal asymptote

e - exponential function as in eb

f - asymmetry factor (When f=1, the curve around the inflection point is symmetrical; therefore, the equation would have four parameters, as seen in LL.4)

Φ - the cumulative distribution function of the normal distribution