Equations for RSP level 2 Infrastructure Form

Equation 1:

$$N_1/N_0 = (V_1/V_0)^{\alpha}$$

Where:

N_0 = number of crashes on the roadway before
N_1 = number of crashes on the roadway after
$\bar{V}_0$ = average operating speed of a roadway before
$\bar{V}_1$ = average operating speed of a roadway after
α = 4 for fatal crashes
α = 3 for fatal & serious injury crashes
α = 2 for all injury crashes

Equation 2:

$$N_{\text{expected}} = w \times N_{\text{predicted}} + (1 - w) \times N_{\text{observed}}$$

Where:

N_{expected} = expected average crash frequency for the study period
$N_{\text{predicted}}$ = predicted average crash frequency predicted using a SPF for the study period under the given conditions
w = weighted adjustment to be placed on the SPF prediction
N_{observed} = observed crash frequency at the site over the study period

and

$$w = \frac{1}{1 + k \times \left(\sum_{\substack{\text{all study} \\ \text{years}}} N_{\text{predicted}}\right)}$$

Where:

k = overdispersion parameter from the associated SPF

Equations for RSP level 2 Infrastructure Form

Equation 3:

$$\text{Incremental BCR} = (PV_{\text{benefits 2}} - PV_{\text{benefits 1}})/(PV_{\text{costs 2}} - PV_{\text{costs 1}})$$

Where:

$PV_{\text{benefits 1}}$ = Present value of benefits for lower-cost project
$PV_{\text{benefits 2}}$ = Present value of benefits for higher-cost project
$PV_{\text{costs 1}}$ = Present value of cost for lower-cost project
$PV_{\text{costs 2}}$ = Present value of cost for higher-cost project

---

Equation 4:

$$\text{Standard error of estimate} = \sqrt{\left[\sum \left(Y_{\text{actual}} - Y_{\text{predicted}}\right)^2 / N\right]}$$

Where:

N = number of comparisons

Equation 5:

$$\text{Standard error} = \frac{s}{\sqrt{n}}$$

Where:

s = standard deviation of the population
n = size of sample

Equations for RSP level 2 Infrastructure Form

Equation 6:

$$\text{Variance} = \left[\sum (x_i - x_{\text{mean}})^2\right] / n - 1$$

Where:

n = number of observations

x_i = the i[th] value in the sample

x_{mean} = the arithmetic mean of the sample

Equation 7:

$$\text{CI}(y\%) = \text{CMF}_x \pm \text{SE}_x \times \text{MSE}$$

Where:

$\text{CI}(y\%)$ = the confidence interval for which it is y-percent probable that the true value of the CMF is within the interval

CMF_x = Crash Modification Factor for condition x

SE_x = Standard Error of the CMF_x

MSE = Multiple of Standard Error

Equation 8:

$$\text{SE} = \sqrt{\left({S_a}^2 + {S_b}^2\right)}$$

Where:

SE = standard error of the difference between two random variables

S_a = the standard error of variable a

S_b = the standard error of variable b