



Lives Saved Tool Technical Note

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The Lives Saved Tool (LiST) offers two ways for users to include ranges around the model's outputs – through the Sensitivity analysis and the Uncertainty analysis

Sensitivity

The Sensitivity analysis tool in LiST uses the 95% confidence intervals around the effectiveness of interventions to estimate the ranges around the model's outputs. Users can select the option to “display sensitivity bounds around results” in the LiST modules' configuration tab. When LiST produce model outputs, this process repeats 3 times, each with the estimate effectiveness of all interventions, the lower confidence intervals, and the higher confidence intervals. The Sensitivity analysis produces the lower bound, estimate, and upper bound model outputs. Users can choose to display model outputs in Spectrum, or export outputs to Excel.

Uncertainty

The Uncertainty analysis tool in LiST uses randomly sampled ranges around the model's inputs to estimate the uncertainty around the model's outputs.

Methods of uncertainty analysis

To estimate the uncertainty around LiST outputs of a single projection, user can access the Uncertainty Analysis tool from the Tools menu when they have the single projection opened in Spectrum. Users are then given the option to edit the number of iterations of sampling around the ranges of the model's inputs, the number of inputs that are varied in the uncertainty runs, and also the uncertainty bounds around the sampled inputs.

The number of iterations refers to the number of times we sample the model's inputs. The default is set to 400 iterations, per suggestion of Davidson et al¹.

¹ Davidson, R., & MacKinnon, J. G. (2000). Bootstrap tests: How many bootstraps? *Econometric Reviews*, 19(1), 55-68.

The plausibility bounds refer to the ranges of sampled model inputs used to produce uncertainty around the model's outputs. The default is set at 95%.

5 categories of model inputs can be varied:

1. effectiveness of interventions
2. mortality rates
3. death causes
4. relative risks of interventions on risk factors
5. incidences of severe diseases

Sampling distributions of model inputs were determined with colleagues from The London School of Hygiene & Tropical Medicine. In general, beta distributions were used for effectiveness of interventions, correlated normal distributions for mortality rates, dirichlet distributions for death causes, and log-normal distributions for relative risks.

In LiST, users specify three factors when running their sensitivity analysis. One factor is the number of runs. The default is 400, but users can set this value with an upper limit of 1,000 runs. The user can also select which of the five input categories to include in the uncertainty runs. The default is to use all five categories, but users can change that for their runs. Finally, the users can also choose to run the uncertainty analysis either assuming correlation between errors within categories or not. For the uncorrelated uncertainty bounds we randomly sample from the distribution for each of the inputs. For the correlated uncertainty bounds we assume that errors in estimates of the values will be correlated within the five input categories. We assume correlations between the errors around model inputs within each category of model inputs, and between categories of model inputs. To simulate this correlation, the uncertainty analysis first randomly samples model inputs according to the specified number of iterations, plausibility bounds, and sampling distributions. These samples across categories of inputs are then ranked. A random number within the specified number of iterations is selected with replacement, and the ranked samples associated with the random number are used to calculate model outputs. This process means that when a value is low for one variable is low for the others. This process repeats for the specified number of iterations, and the uncertainty analysis produce the low, median, and high model outputs. Users can choose to display model outputs in Spectrum, or export outputs to Excel.

Users can also use the Uncertainty Analysis tool to generate uncertainty for multiple projections' model outputs. Users will have to make sure all projections are closed in Spectrum, and navigate to the Tools menu, where the Uncertainty (Batch mode) option will be available. Users can add in multiple projections, and are given the option to edit number of iterations and plausibility bounds.