# BMDS 3.2 README



The U.S. Environmental Protection Agency's (EPA) Benchmark Dose Software (BMDS) facilitates the application of benchmark dose (BMD) methods to EPA hazardous pollutant risk assessments.

This version of BMDS was co-developed with support from the National Institute for Occupational Safety and Health (NIOSH).

## 1. WHAT'S NEW IN BMDS 3.2

The most significant enhancement is **the addition to the BMDS model suite of preview versions of Bayesian continuous models**. Users can set up individual Bayesian model runs as Normal, Lognormal, or combined Normal and Lognormal.

These preview Bayesian continuous models have not been formally reviewed and approved by the EPA for risk assessment purposes. EPA welcomes feedback on these preview models.

**Note that at this time EPA does not offer technical guidance on Bayesian modeling.**

BMDS 3.2 includes the following enhancements and fixes to the existing continuous models:

- Rescaled the v parameter for the Hill model to agree with BMDS 2.7 results.
- Rescaled model parameters during the optimization process to improve robustness and efficiency of optimization routines.
- Devised a new maximum for the beta term in the Exponential 5 model (frequentist and Bayesian) for compatibility with the BMDS optimizers.
- In some cases, some continuous models may not return values for the maximum-likelihood estimation (MLE). For these cases, BMDS will display an appropriate warning on the results summary tab for that model; the individual model result tab will not be created. This issue will be corrected in a future release.
- For continuous models, when the degrees of freedom value is less than or equal to zero, BMDS now reports "NA."
- Fixed a bug with the continuous Bayesian check-all ("Enable") button on the Main tab.

The BMDS 3.2 interface disables controls for continuous model averaging, which was originally slated to be included in this release. Continuous model averaging will appear in a future release.

BMDS 3.2 includes the following user interface enhancements

- BMDS graphs now extend the plots to zero dose for all models. All plots will begin at dose=0, even if the data has a lowest dose greater than 0.
- Added a hover tip to the "Select Output Directory" box that displays the full path name on the Analysis Workbook's Main and Report Options tabs; the path is updated when a previous analysis is loaded, and when a user changes the specified output directory.
- The first five rows of the Analysis Workbook's Data tab are frozen to keep the **Insert New Dataset** and **Import Dataset** buttons visible as new datasets are entered.
- On the Results Workbook's Abbreviations tab, added the abbreviations list for all models (previously, only the dichotomous model abbreviations were listed).
- On the Data tab, clarified custom header cells for datasets by 1) changing the custom header columns to "[Custom]", and 2) adding informational text to the right of the Insert and Import buttons.
- Added "Distribution" information for the continuous models on the ModelParms tab.
- Improved error messaging for easier bug reporting when models fail while retrieving results from the dynamic link library (DLL).
- The Results Workbook entry for Litter Specific Covariate (LSC) (under User Input > Model Options) now reports the fixed LSC value in output for nested models.

BMDS 3.2. includes the following fixes and feature enhancements:

- Fixed a bug that caused dichotomous multi-tumor analysis (MS_Combo) to crash 64-bit Excel.
- Fixed an MS_Combo bug that allowed multiple runs to be set as selected when searching for lowest Akaike Information Criterion (AIC) when no model parameters hit a boundary.
- Corrected the equation used to plot the Dichotomous Hill dose-response curve.
- When importing BMDS 2.7 .dax files that contain disallowed characters in the column headers, BMDS 3.2 will remove the disallowed characters.
- Fixed an issue that caused "delete" buttons to render inaccurately when deleting option sets.
- Fixed a bug in the model code that caused some model parameters to be incorrectly classified as bound.

The BMDS Release History page lists all features, enhancements, fixes, and changes for each BMDS 3 release.

## 2. KNOWN ISSUES

- All AIC and log-likelihood results in 3.2 should match those in previous 3.x releases. However, there may be occasional differences from BMDS 2.7 results.
- In 64-bit Excel, running MS_Combo with a single dataset causes a memory error.
- When selecting a BMR Type of "Hybrid-extra risk" and specifying a new value for Tail Probability, select a different BMR Type and then re-select "Hybrid-extra risk." This will ensure the Tail Probability value will persist.
- If the user is having difficulty running datasets of individual response data, try sorting the doses in increasing numeric order.

## 3. SYSTEM REQUIREMENTS

BMDS requires the desktop version of Microsoft Excel 2010, 2013, or 2016 (32- or 64-bit) for Windows or later with macros enabled (see below). We recommend using the Office 365 or standalone Microsoft Office installation methods rather than installing via the Microsoft Store.

BMDS is compatible with 64-bit versions of Microsoft Windows.

BMDS does not run on macOS systems; instead, we recommend installing a Windows virtual machine and running BMDS from there.

## 4. DOWNLOADING/INSTALLING

BMDS is distributed as a .zip file, which can be unzipped to any folder where the user has read/write privileges. Administrator privileges are not required.

Follow the instructions on the BMDS Download page to download and install the latest BMDS version.

***Note*** BMDS ***must be removed*** from the zip file and installed on your hard drive before you can use it.

## 5. ENABLING & DIGITALLY SIGNING EXCEL MACROS

For BMDS to function, you will need to enable macros in Excel the first time you run BMDS. Visit the Microsoft support site for information on enabling Excel macros.

BMDS is shipped with its macros unsigned. If your organization requires macros to be digitally signed for security purposes, follow Microsoft's instructions for digitally self-signing the macros in your copy of BMDS.

If you would prefer a version of BMDS with the macros digitally signed, please file a BMDS eTicket and enter your contact information. In the eTicket Subject field, enter "Request digitally signed BMDS 3.2."

**Warning** The digitally signed version of BMDS 3.2 may not work consistently across different versions of Excel, including 32- and 64-bit versions.

## 6. HELP & SUPPORT

- Check the BMDS Support Articles page for information on known issues, upcoming enhancements, and workarounds

- Check the BMDS Release History page for a detailed list of all bug fixes and enhancements included in each BMDS 3.x release
- File an eTicket for direct support or to provide feedback
- Sign up to receive email announcements on updates and training
- Check the BMDS web site for updates and additional information