EPA's Benchmark Dose Software and Related Dose-Response Models and Methods.

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Abstract: The EPA developed the Benchmark Dose Software (BMDS) as a tool to help Agency risk assessors facilitate applying benchmark dose (BMD) method's to EPA's human health risk assessment (HHRA) documents. The application of BMD methods overcomes many well know limitations of the more traditional NOAEL/LOAEL approach, and its use has expanded internationally to include thousands of users world-wide. The current version of BMDS allows users to model a number of different types of data, including quantal data, continuous data, and clustered developmental toxicity data. Advanced models that incorporate time as a variable into the modeling scheme are also offered, including models for time-to-tumor analysis, repeated-response data, or concentration $\times$ time data. To stay current with the state-of-the-science in this field, EPA has continued to research and implement new dose-response methods for inclusion in BMDS or development as stand-alone products. Recently, EPA released the new user interface for its Categorical Regression software, facilitating the analysis of severity data and the use of meta-analytical methods. Other current projects include the development of frequentist and Bayesian model averaging approaches to address model uncertainty, Bayesian meta-regression methods for modeling data from multiple epidemiological studies, and using BMD modeling to assess the toxicological similarity of chemical mixtures. Other research projects include the implementation of the hybrid approach for defining risk for continuous endpoints in a dichotomous fashion, implementation of log-normal distributions for continuous data, and further development of probabilistic dose-response methods. Disclaimer: The views expressed in this abstract are those of the authors and do not necessarily represent the views or policies of the U.S. Environmental Protection Agency.