

# **Estimation of Treatment Effects without Monotonicity Assumption in Dose-Finding Studies**

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## **Abstract**

During the process of drug development, dose-response studies are conducted to evaluate the treatment effects at various doses of the test drug. The primary focus of dose-response studies is usually on identifying the minimal effective dose (MED) and on estimating the treatment effect at each dose level. We propose an error-splitting method to construct the simultaneous confidence intervals to estimate the treatment effects when dose-response relationship is non-monotone. Through simulations, our extended method further demonstrates the ability to gain more information for the treatment effects.