

Minimizing the Impact of Covariate Detection Limit in Logistic Regression

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Abstract : In many epidemiological and environmental studies covariate measurements are subject to the detection limit. In most applications, covariate measurements are usually truncated from below which is known as left-truncation. Because the measuring device, which we use to measure the covariate, fails to detect values falling below the certain threshold. In regression analyses, it causes inflated bias and inaccurate mean squared error (MSE) to the estimators. This paper suggests a response-based regression calibration method to correct the deleterious impact introduced by the covariate detection limit in the estimators of the parameters of simple logistic regression model. Compared to the maximum likelihood method, the proposed method is computationally simpler, and hence easier to implement. It is robust to the violation of distributional assumption about the covariate of interest. In producing correct inference, the performance of the proposed method compared to the other competing methods has been investigated through extensive simulations. A real-life application of the method is also shown using data from a population-based case-control study of non-Hodgkin lymphoma.

Keywords : environmental exposure, detection limit, left truncation, bias, ad-hoc substitution

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