



## **A flexible Zero-Augmented Generalized Gamma Mixed Effects Regression Calibration model to Correct for Measurement Error in Episodically Consumed Food**

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### **Abstract**

In nutritional epidemiologic studies, dietary intake is often reported with error in the questionnaire. The dietary intake measurement error usually attenuates the association that relates dietary intake with risk of a disease. As a result, many epidemiologic studies conduct a calibration sub-study to obtain the unbiased measurement for true usual intake. The unbiased measurements can be used to adjust for the error in the questionnaire via regression calibration. Regression calibration predicts the conditional mean of true usual intake given some covariates. Complexities may arise when the unbiased measurements, used as the response in the calibration model, are zero-inflated with skewed-heteroscedastic variance. This is common for foods that are not consumed daily, i.e., episodically consumed foods. We proposed a Zero-augmented Generalized Gamma Mixed Effects Regression Calibration model that can handle the aforementioned complexities and applied the model to NHANES 2003-2004 data. The aim was to investigate the association between fish intake and the blood mercury level. We, further, evaluated the proposed method with the naïve method that ignores error in the reported fish intake. With the naïve method, the mercury level is estimated to increase by about 27% per oz intake of fish, whereas with the proposed method, the effect increases by about five fold. In conclusion, the proposed method is able to adjust for the bias caused by measurement error in the questionnaire, when the calibration response cannot be approximated with the standard distributions. The presentation will cover the problem background, a description of the proposed method and its comparison with other methods, application results and further recommendations.

**Keywords:** bias; covariate measurement error; generalized gamma; zero-inflated models.