ADJUSTING FOR MULTIVARIATE MEASUREMENT ERROR IN META-ANALYSES

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Measurement error in multiple risk factors can lead to biased associations of the true underlying risk factors with disease. Multivariate regression calibration can correct for measurement error by replacing the error-prone risk factors with estimates of the expectation of the true values conditional on the measured values. We extend on the multivariate regression calibration technique to allow for a meta-analysis framework and 1) time trends in the measurement error variance; 2) heteroscedastic measurement error (e.g. measurement error variance may increase with level); 3) binary and categorical covariates (e.g. smoking status). Bootstrapping methods are used to allow for uncertainty in the regression calibration models. Our methods are used to assess the relationship between usual levels of plasma fibrinogen and the risk of coronary heart disease adjusting for several error-prone confounders, using individual data from 154 211 adults in 31 prospective long-term studies. Repeat measures of fibrinogen and the error-prone confounders are observed in subsets of individuals from different studies at various re-measurement times. We find the adjusted hazard ratio for coronary heart disease and plasma fibrinogen decreases after correcting for measurement error using multivariate regression calibration.