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A more efficient estimator for simulated data on genetic loci associated with plasma concentrations of LDL-C, HDL-C, triglycerides, ApoA1, and ApoB among women in genome wide analysis

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In the experiments on Quantitative Trait Loci (QTL) mapping, typically phenotypic data on multiple correlated traits are collected. However, most genetic association analyses consider traits separately and ignore potential correlations among the traits. A Seemingly Unrelated Regression (SUR) system that was introduced by Zellner in 1961, includes several individual relationships that are linked by the fact that their disturbances are correlated. In this study, we developed SUR model as a more efficient multivariate model for correlated traits to evaluate the extent of common genetic influence on five plasma lipid fractions; i.e., Low Density Lipoprotein Cholesterol (LDL-C), High Density Lipoprotein Cholesterol (HDL-C), triglycerides, Apolipoprotein A1 (ApoA1), and Apolipoprotein B (ApoB). By jointly analyzing multiple correlated continuous traits, this model leads to more efficient estimators by combining information on different equations compared to the traditional multivariate model. Moreover, in contrast to the traditional multivariate model, different traits can have different sets of predictors through SUR model. Simulated data from genetic analysis illustrate application of the proposed method. The analysis was performed with knowledge of the simulation model. The proposed model can examine multiple single-nucleotide variations simultaneously and incorporate family-specific, subject-specific, or time-varying covariates.

Analysis of the simulated data illustrated the applicability of the proposed approach in modeling genetic loci associated with multivariate outcomes of plasma concentrations of LDL-C, HDL-C, triglycerides, ApoA1, and ApoB among women in genome-wide analysis. Results from simulation studies also showed that the estimators from the proposed model were more efficient compared to those based on ordinary least square. Furthermore, comparative performances of the estimators were investigated on the basis of the standard errors of the parameter estimates and the results indicated that the estimators performed better as the sample size increased.

Biography

Sareh Keshavarzi completed her PhD at Shiraz University of Medical Sciences. She also worked as an Assistant Professor. Her research efforts to date have led her to publication of 32 refereed papers, 6 technical papers, 3 major reports or published abstracts and 19 presentations of her research at professional meetings at the regional, national and international levels.

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