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Joint modeling multivariate longitudinal healthcare utilization outcomes

Mulugeta Gebregziabher
Medical University of South Carolina, USA

Abstract

Many health outcomes are observed longitudinally and their evaluation is interdependent. Typically, a generalized linear mixed model (GLMM) is used to model the trajectory overtime of each outcome separately. However, modeling these outcomes separately ignores the interdependencies and that could lead to in efficient use of data and invalid inference. The objective of this study is to develop a random effects approach for jointly modeling multivariate longitudinal health outcomes that accounts for this interdependence. We use data from a national cohort of 740,195 veterans with diabetes (followed 2002-2006) to study the association between these outcomes and important covariates. We consider a vector of longitudinal cost outcomes (inpatient, outpatient and pharmacy cost) measured in 2006 US dollars as a response variable and demonstrate the application of a joint modeling approach that links the longitudinal outcomes through random coefficients (intercepts and slopes) in their respective GLMMs. The results of the study show that the parameter estimates of the association between cost and key covariates from the joint modeling approach have more accurate estimate of precision and are in the expected direction than those from separate modeling of each outcome. Thus, the proposed multivariate generalized linear mixed model (mGLMM) approach allows for joint modeling of longitudinal cost data from multiple sources accounting for their correlation or interdependence.

Key words: correlated data, cost, GLMM, joint modeling, random coefficient

Biography

Mulugeta Gebregziabher is an Associate Professor of Biostatistics at the Dept of Public Health Sciences, MUSC. He received his Ph.D. in Biostatistics from the University of Southern California in 2006. He is the President of the South Carolina Chapter of the American Statistical Association. His research interests include longitudinal and missing data analysis and semiparametric inference. He has published more than 50 papers in peer reviewed scientific journals.