Introduction

Evaluating the burden of diseases and related risk factors is essential to identify key health priorities. Some studies have investigated the global and national pattern of disease burden for analyzing the data is undoubtedly crucial to circumvent the problems and obtain satisfactory estimates of model parameters and reach accurate assessment.

Keywords: Burden of diseases, Iran, misalignment, spatio-temporal models, study profile


Study Protocol

Application of Spatio-temporal Model to Estimate Burden of Diseases, Injuries, and Risk Factors in Iran 1990 – 2013

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Abstract

Background: Identifying the burden of disease and its inequality between geographical regions is an important issue to study health priorities. Estimating burden of diseases using statistical models is inevitable especially in the context of rare data availability. To this purpose, the spatio-temporal model can provide a statistically sound approach for explaining the response variable observed over a region and various times. However, there are some methodological challenges in analysis of these complex data. Our primary objective is to provide some remedies to overcome these challenges.

Method: Data from nationally representative surveys and systematic reviews have been gathered across contiguous areal units over a period of more than 20 years (1990 – 2013). Generally, observations of areal units are spatially and temporally correlated in such a way that observations closer in space and time tend to be more correlated than observations farther away. It is critical to determine the correlation structure in space-time process which has been observed over a set of irregular regions. Moreover, these data sets are subject to high percentage of missing, including misaligned areal units, areas with small sample size, and may have nonlinear trends over space and time. Furthermore, the Gaussian assumption might be overly restrictive to represent the data. In this setting, the traditional statistical techniques are not appropriate and more flexible and comprehensive methodology is required. Particularly, we focus on approaches that allow extending spatio-temporal models proposed previously in the literature.

Since statistical models include both continuous and categorical outcomes, we assume a latent variable framework for describing the underlying structure in mixed outcomes and use a conditionally autoregressive (CAR) prior for the random effects. In addition, we will employ misalignment modeling to combine incompatible areal units between data sources and/or over the years to obtain a unified clear picture of population health status over this period. In order to take parameter uncertainties into account, we pursue a Bayesian sampling-based inference. Hence, a hierarchical Bayes approach is constructed to model the data. The hierarchical structure enables us to “borrow information” from neighboring areal units to improve estimates for areas with missing values and small number of observations. For their general applicability and ease of implementation, the MCMC methods are the most adapted tool to perform Bayesian inference.

Conclusion: This study aims to combine different available data sources and produce precise and reliable evidences for Iranian burden of diseases and risk factors and their disparities among geographical regions over time. Providing appropriate statistical methods and models for analyzing the data is undoubtedly crucial to circumvent the problems and obtain satisfactory estimates of model parameters and reach accurate assessment.

Keywords: Burden of diseases, Iran, misalignment, spatio-temporal models, study profile