Bayesian Autoregressive Multilevel Modelling of Burden of Diseases, Injuries and Risk Factors in Iran 1990 – 2013

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Abstract

Background: Statistical modeling and developing new methods for estimating burden of diseases, injuries and risk factors is a fundamental concern in studying the country health situation for better health management and policy making. Bayesian autoregressive multilevel model is a strong method for this kind of study though in complex situations it has its own challenges. Our study aims to describe the way of modeling space and time data through a autoregressive multilevel model and address challenges in complex situation.

Method: We will obtain data from different published and unpublished secondary data sources including population-based health surveys (e.g. NHS, DHS, STEP) at national and provincial levels and we also assess epidemiological studies via systematic review for each disease, injuries and risk factor over the period of 1990 – 2013. These data generally have a multilevel hierarchy and also time correlation. However, statistical analysis of diseases, injuries and risk factors data is primarily facing the problem of information scarcity. Data are generally too scarce to ensure reliable estimates in many practical problems. Also, there may be nonlinear changes over time, different kind of uncertainties in data and incompatible geographical data. We describe Bayesian autoregressive multilevel modeling approach that provides a natural solution to these problems through its ability to sensibly combine information from several sources of data and available prior information.

In this hierarchy model levels of each hierarchy borrow information from each other and also lower levels borrow information from higher levels. We will fit the model using Markov Chain Monte Carlo (MCMC) methods because of its capabilities and benefits in complex cases.

Discussion: Our analyses will include different existing sources of data in Iran for 24 years through a rational and reasonable model to estimate burden of diseases, injuries and risk factors for Iran at national, regional and provincial levels while considering several kinds of uncertainties. Comprehensive and realistic estimates are always an issue of request that will be obtained through a suitable statistical modeling considering all dimensions and then can be used for making better decision in real situations.

Keywords: Autoregressive time series, burden of diseases, Iran, MCMC, multilevel models, NASBOD

Introduction

Precise assessment of global, regional, and country health conditions and trends is crucial for evidence-based decision making for Public Health.1 The Global Burden of Disease Study (GBD) is the latest and most reliable analysis to reveal the importance of taking different approaches to the challenges facing global health.2 The GBD study results provide us a data-rich structure for comparing the effects and burden of different diseases, injuries, and risk factors on premature death and disability between populations.3–13 But these results are not for within popula-


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