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Spatio-temporal quantile interval regression using R-INLA with applications to childhood overweight and obesity in sub-Saharan Africa

Owen P L Mtambo

Namibia University of Science and Technology, Namibia

Childhood malnutrition has serious adverse effects on a child, a family and the development of a country. It leads to more than 30% of deaths in children below five years in sub-Saharan African countries. A malnourished child is more likely to be sick and die. Malnutrition can lead to stunted growth, overweight and obesity, impaired cognitive and behavior development, poor school performance, lower working capacity and lower income. It can slow down economic growth and increase level of poverty. Furthermore, it can prevent a society or a nation from meeting its full potential through loss in productivity, cognitive capacity and increased cost in health care. The indicators of malnutrition range from stunting, wasting and underweight to overweight and obesity. In the past, childhood undernutrition was used to be the most malnutrition burden over the past two decades across the sub-Saharan Africa and is still remaining a burden to date. Doubly surprising, childhood overnutrition is alarmingly becoming the most prevalent parallel to still existing undernutrition burden in sub-Saharan Africa. Overweight and obesity rates are reaching epic proportions in sub-Saharan Africa. The prevalence of childhood overweight and obesity in sub-Saharan Africa was 8.5% in 2010 and is expected to reach 12.7% by 2020. The consequences of overnutrition can be more devastating than those for undernutrition because it leads to chronic failure problems which in turn lead to increased medical expenditure. For this reason, only childhood overweight and obesity were analyzed in this study, in order to assess socio-demographic and socio-economic determinants of childhood overweight and obesity in sub-Saharan Africa. This study also assessed the geographical variation of childhood overweight and obesity in sub-Saharan Africa with more emphasis on both spatial and spatio-temporal effects. All available Demographic and Health Survey (DHS) datasets since 2000 were used and the statistical inference was fully Bayesian using R-INLA package in the selected countries. Almost all studies on spatial quantile modelling of childhood overweight and obesity have emphasized on selecting only one specific response quantile level of interest and report the recommendations based on the only chosen response quantile. Unlike mean response modelling, quantile regression yields model estimates which are stochastic functions of quantile levels such that. This implies that quantile regression modelling using estimates based on only one chosen quantile level might be inefficient and not robust enough. $0 < \tau < 1$. In this study, we used weighted mean estimates based on all quantiles in the quantile interval which corresponded to modelling childhood overweight and obesity. We found out that the significant $\beta = 0.90 \pm 0.05$ determinants of childhood overweight and obesity ranged from socio-demographic factors such as type of residence to $\beta = [0.85, 0.95]$ child and maternal factors such as child age, duration of breastfeeding and maternal BMI. We also observed significant positive structured spatial effects on childhood overweight and obesity mostly in the regions in the center of Namibia.

Biography

Owen P L Mtambo is a Lecturer in Statistics at Namibia University of Science and Technology since March 2014. He was a Lecturer in Statistics at University of Malawi from July 2007 to March 2014. He was Secondary School Teacher in Mathematics and Physics from January 2002 to June 2007. He holds an MSc (Biostatistics) with credit (2012), a BSc (Mathematical Sciences) with distinction (2007), and a DipEdu (Sciences) with distinction (2001); all obtained from University of Malawi. He has more than 8 publications. Currently, he is pursuing his PhD in Statistics at University of South Africa (UNISA) since February 2016.

omtambo@gmail.com

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