Bayesian and Frequentist Comparison: An Application to Low Birth Weight Babies in Ghana

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Abstract

The aim of this study is to evaluate the association between maternal factors and birth weight among babies by using and comparing frequentist and Bayesian methods’ results from an epidemiologist or public health point of view. Low birth weight babies, defined by WHO as babies born at term who weigh less than 2.5kg is an important indicator of reproductive health and general health status of any Population. The incidence of low birth weight is quite high in the sub region which has a public health concern. The study used a data set based on Multiple Indicators Cluster Survey conducted by Ghana Statistical Service in 2011 to monitor progress of women and children. A sample of 10,963 women within the reproductive age (15 – 49) years across the country between 2009 and 2011 were selected for the survey. The results from the frequentist and the Bayesian models show that, the two approaches can yield similar results using same data set. However, there are factors that the Bayesian technique can unfold which might not be the case using the frequentist model. We were able to show that the Bayesian approach may have advantages over the frequentist one, particularly with respect to our data. The use of informative priors might however be useful in narrowing credible interval and providing precise choice between the null and alternative hypothesis. In case of borderline frequentist results, the Markov Chain Monte Carlo method may be more conservative, particularly without priors. Comparing the two approaches with respect to our data set, we can infer (from table 4) that using Bayesian model provides better estimates in predicting low birth weight among babies in Ghana. We note however that to better understand the phenomenon under study the two methods should be used together. Our findings further revealed that low birth weight is not only a public health problem but also a socio-cultural issue.

Keywords: Low birth weight, Frequentist, Bayesian, Informative Priors.