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Modeling Asia's Child Mortality Rate: A Thinking of Human Development in Asia

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Abstract

Multiple linear regression model was employed to model child under age of five mortality rate and related factors in Asia of year 2010. Data analysis was carried out to find factors which influence the child mortality in Asia. Correlation analysis was done to check on the relationship among all the variables, as well as to identify the problem of multicollinearity in the data. Having fitted multiple linear regression, it was found that mortality rate of children under age of five in Asia countries are significantly influenced by percentage of case detection for all forms of tuberculosis, number of reported deaths on measles, number of population using an improved drinking water source, and number of birth trauma reported. Among those variable, it was identified that number of population using an improved drinking water source is the most important factor.

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Keywords: Regression, Mortality rate, Backward elimination, Asia, Variable selection

1. Introduction

Recently, United Nation reported that the well-being of children has improved and child mortality rate has decreased remarkably in most countries through worldwide effort since year 1950 (UNESCAP) (2013). However,

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there has been slower progress in reducing the neonatal mortality rate, and the progress in achieving the Millennium Development Goals (MDG) which was targeted to reduce the under-five mortality rate by two-thirds by year 2015 seems insufficient.

According to United Nations Children's Fund (UNICEF, 2012), although the child mortality rate is falling globally, but there is still some high mortality rate in few regions that cause the decline rate is not quickly enough in sustaining children survival (UNICEF, 2012). Out of the 67 countries which are defined as having high child mortality rate region, only 10 countries are on track in meeting the MDG target. Based on the UN report (UNESCAP, 2013), East Asia shown the highest decline in child mortality rate, followed by Southeast Asia, West Asia, South Asia, and the lowest in Central Asia. The children under-five mortality rate in Asia had declined half of its percentage level between year 1990 and 2011. But, the progress of decline is also not fast enough to meet the MDG targets in child survival as mentioned. Based on that facts, the objectives of this study was to model the interrelationship between the Asia child under age of five mortality rate and its factors such as the carbon dioxide emissions, percentage of Hepatitis B immunization coverage among one-year-olds, percentage of case detection rate for all forms of tuberculosis, number of reported deaths on human immunodeficiency virus (HIV), number of reported deaths on measles, percentage of population using an improved drinking water source, percentage of children one-year-olds immunized against measles, and number of birth trauma reported.

2. **Literature Reviews**

2.1. Child mortality studies

UNICEF (2013) mentioned that child mortality statistics in sub-Saharan Africa and south Asia shown the highest child death, which consist of 41% and 34%, respectively. A research in estimating the distribution of deaths in children of age under-five by several causes for 42 countries in year 2000 by using a prediction model was conducted by Black et. al (2003). The outcome from the prediction model was compared to the World Health Organization (WHO) statistics. An analysis on the differences between these two approaches were analyzed and contributed to an understanding to the strengths and weaknesses for those child mortality major causes, such as neonatal, diarrhea, respiratory infections, acquired immunodeficiency syndrome (AIDS) and other causes.

Gabriele and Schettino (2008) had conducted few analyzes such as ordinary least square (OLS) regression technique to illustrate a model for basic causal relations among UN listed factors such as prevalence of underweight, and under-five child mortality. Furthermore, a seemingly unrelated regression (SUR) was also conducted to analyze the child mortality systems of the impact of underweight and under-five child mortality variables on high and low income families. Sarmin et. al (2014) made a study in predicting and comparing the Bangladesh mortality of children under-five caused by diarrhea between the Bangladesh children who showed septic shock and drowsiness in year 2010 and 2011. They analyzed their data with chi-square test in comparing the differences in proportions, the differences in means by Student's *t*-test, and those data which were not normally distributed by Mann-Whitney test.

2.2. Multiple linear regression model

Draper and Smith (1981), and Aiken et al. (2003) have conducted studies regarding the use of multiple regression analysis as a general system in examining on the relationship for a few independent variables to a dependent variable. They also discussed more in model building of multiple linear relationships and the application of multiple relationships to the problems of analysis of variance. According to Draper and Smith (1981), the general form of multiple regression model which is used to investigate the contribution of various independent variables to dependent variable is written as,

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k + \varepsilon \,, \tag{1}$$