

LOVELY PROFESSIONAL UNIVERSITY

MASTER OF SCIENCE

STUDY OF INFANT MORTALITY USING REGRESSION ANALYSIS

A project submitted in fulfilment of the requirements

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in

Department of Mathematics

School of Chemical Engineering and Physical Sciences

Lovely Faculty of Technology and Sciences

Samridhi Sud

Registration Number: 11604800

Supervisor:

Dr. Tina Dutta



29thNOV, 2017

DECLARATION

I hereby declare that the work reported in the Msc. Dissertation entitled, “**Study of Infant Mortality using Regression Analysis**” submitted to **Lovely Professional University, Phagwara, Punjab, India**, is an authentic record of my work carried out under the supervision of **Dr. Tina Dutta**. I have not submitted this work elsewhere for any other degree or diploma.

Samridhi Sud

Registration Number - 11604800

Department of Mathematics

Lovely Professional University, Phagwara, Punjab, India

Date: 29 Nov, 2017

CERTIFICATE

This is to certify that the project work entitled “Study of Infant Mortality using Regression Analysis ” which is being submitted by Samridhi Sud under my guidance in the fulfilment for the award of degree Master of Science in Mathematics by the Lovely Professional University, Punjab, is the record of candidate’s own work carried out by her under my supervision. This work has not been submitted partially or wholly to any other University or Institute for the award of this or any other degree.

Signature:
Supervisor: Dr. Tina Dutta
Assistant Professor
LPU, Punjab

Date: 29th Nov, 2017

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1. Introduction

Infant mortality, as defined by number of deaths of children before the age of one, is considered to be one of the most important indicators of health and well-being of a society. It is measured by infant mortality rate (IMR), which is the number of deaths of children under one year of age per 1000 live births. As per the World Factbook records (CIA, 2017)¹, India ranks at the bottom 47 countries with IMR 39.10 out of 225 countries in the world. Ironically, even being considered as economic superpower among the developing countries in the world, India's level of IMR is far worse than other developing countries such as Bangladesh, Nepal, Bhutan, Malaysia, Indonesia and so on (CIA, 2017). Although the overall infant mortality in India has declined over the last decades, the rate of decline has been slower than expected (Claeson et al 2000). This is why India could not conform to the Millenium Development goals (MDG) 2015, which was to reduce infant mortality by two-third during the year 1990 to 2015. This highlights a perennial lacuna in the social development of our country as even after seventy years of independence the situation of infant and child healthcare of the country is so grim.

In the backdrop of poor infant mortality status of India, the present paper aims to study and unravel broad factors affecting the IMR in the country. The analysis will help us to identify which factors contribute to high or low IMR of India.

2. Literature Review

Zakir and Wunnava (1999) studied IMR of 117 countries and found that fertility rate, female literacy rate, female labourforce participation and countries' Gross National Product (GNP) per capita have significant effect on IMR. They found that higher fertility rate and low female literacy rate of a country increase IMR significantly. Frey and Field (2000) find that policies focusing on enhancing female education, reducing economic inequality and reducing foreign debts could significantly improve infant mortality situation of the less developed countries. Gage et al (2013) investigated the relationship between maternal education, birth weight of child and incidence of infant deaths in the US. They empirically establish that focus on improving birth weight may not reduce infant mortality effectively if maternal education is not taken into consideration. Maternal education appears to increase birth weight of newborns that could reduce the chances of infant deaths in turn. However, for all racial and ethnic groups, the study finds strong effect of maternal education (independent of birth weight of child) in reducing the mortality of infants.

At the national level also, female literacy has been acknowledged to be one of the major factors to influence infant and child deaths (Gokhale 2002). For e.g. Gokhale et.al (2002) state

¹ "The World Factbook" <https://www.cia.gov/library/publications/the-world-factbook/rankorder/2091rank.html> (accessed on 24.11.2017)

that mother's education plays an important role in utilization of maternal and child health (MCH) services in India and that reduce infant deaths in turn. Jain (1985) reasons that female literacy affects infant mortality through its association with better utilization of medical care during birth of child, pre-natal care services and also better utilization of preventive and curative measures during post-natal period. That is why in the absence of better medical facilities in the region, high female literacy may not be effective in preventing infant deaths.

In some developing countries such as Bangladesh, infant mortality is found to be sex-selective and a significant association is found between infant mortality and future health outcome of the surviving child (Dancer et al 2007). Dancer et al (2007) elaborates that male infants are less likely to survive during their first year of birth; but upon survival, they are healthier than their female counterparts. Thus, gender of child, incidence of infant mortality and child nutrition outcomes are somewhat interrelated. Adlakha and Suchindran (1985) analyzed the determinants of infant and child mortality of four countries, viz. Egypt, Jordan, Tunisia, and Yemen, and found that mortality of female children had been persistently high in all four countries. Factors, such as mother's education, socioeconomic factors, and urban-rural residence influence survival of infants and children to much extent. For these countries, the infant mortality rate for the non-breast-feeders found to be substantially higher than for the breast-feeders.

Role of income or economic well-being of a society is also crucial in determining infant deaths. Stockwell et al (2005), in their study of infant mortality of Ohio metropolitan city during the period 1960-2000, find that the inverse relation between income status and infant mortality has been lucid and becoming stronger over the study period. They prescribe that unless the economic well-being of the underprivileged is improved, the public health programmes might not be effective in containing infant mortality. However, the relation between income and incidence of infant deaths may not be straightforward all the time. For e.g. Waldann (1992), while analyzing the relation between income and infant mortality of two countries, found that for the same level of real income of poor, the country having higher real income of wealthy people, showed higher level of infant mortality. He also found that high infant mortality is associated with high income inequality after controlling the effect of factors such as fertility, medical personnel and education. This shows that more than income level of a society; it is the income inequality that affects infant mortality strongly and positively. He further suggests that this anomalous positive relation between income and infant mortality indicate inappropriateness of selection of real income as a proxy for social welfare.

Visaria (1985) analyses the national and state level neonatal, postnatal and infant mortality by sex in rural and urban India during 1950s-1970s. She finds that over the last 20 years, while infant mortality declined, the level of neonatal deaths remained constant. She emphasizes on simple policy interventions focused on increasing antenatal care visits and improving sanitary conditions at the time of birth could effectively reduce neonatal deaths. Using data from National Family Health Survey (1998-1999), Brinker and Amonker (2005) found that

socioeconomic development, health care, and education, lead to access to family planning information and services that help in lowering the infant mortality rate among the states of India.

3. Data

The present paper uses the data from National Family Health Survey (NFHS-3) conducted in the year 2005-06 to study and analyze the factors affecting infant mortality of India. NFHS is a large-scale nationally representative survey (conducted by IIPS, Mumbai) that provides data and information on various socio-economic-demographic factors of sampled men, women and children in the country in regular intervals (usually in 5 years). We shall use both the aggregate data available in its reports and the unit-level data of NFHS 2005-06.

4. Methodology

In our study, we will use multiple regression analysis to identify and analyze the factors affecting infant mortality. The data will be analyzed using STATA software.

The multiple regression equation for modeling infant mortality is given by:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \cdots + \beta_k X_{ki} + \epsilon_i$$

Where Y_i is the dependent variable i.e. infant mortality rate (IMR). The X_1, X_2, \dots, X_k are the set of independent variables which are likely to affect IMR. The independent variables will be selected on the basis of existing literature and general causality between IMR and various socio-economic demographic factors. The error term in the model is denoted by ϵ_i .

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