Determinants of infant mortality: empirical evidence from Hyderabad Karnataka region

Kumara Naik[1], Dr. Ponnaluru Srinivasa Sasdhar[2]

Department of Economics, VijayanagaraSri Krishnadevaraya University, Ballari, India
kumarvskub@gmail.com, sasdhar@vskub.ac.in

Abstract

Objectives: The Hyderabad Karnataka region comprising of Ballari, Koppal, Bidar, Raichur, Gulbarga, Yadagiri districts in Karnataka is economically backward region in India. This study quantifies the impact of socioeconomic and maternal factors that affect infant mortality in the region.

Methods/Findings: This study finds evidence in regional imbalances in terms of Infant Mortality Rate. Family welfare data spanning over nine years from 2008 to 2016 was in IMR analyzed using regression techniques and results from our model indicate that statistically significant differences exist between Hyderabad Karnataka region and rest of Karnataka after controlling for social and economic factors.

Application: The results from our model can be used for regional planning and development.

Keywords: Infant mortality determinants, Hyderabad Karnataka, Regional Imbalances.

1. Introduction

Infant mortality rate is one of the important indicators of socioeconomic development. Hyderabad Karnataka region comprising of Ballari, Koppal, Bidar, Raichur, Gulbarga, and Yadagiri districts of Karnataka State, India is identified by Nanjundappa Committee report as economically backward. Infant mortality refers to the number of deaths of children less than one year of age per thousand births. Reduction in infant mortality is one of the Millennium Development Goals (MDG). Karnataka recorded 32 as IMR in 2015 while the state target was to achieve less than 15. Previous studies found that socio economic factors such as mother's education, labor force participation, per capita income, infant's birth weights, and infrastructure affect the IMR. However, it remains to be estimated as to how these factors affect IMR in the study region, given the economic backwardness. We hypothesize that significant differences exist between infant mortality rate in Hyderabad Karnataka region and non-Hyderabad Karnataka even after controlling for other socio-economic factors.

This study develops an econometric model using a panel data set from Ministry of Health and Family Welfare for district level data spanning nine year period from 2008 to 2016. Results from our model indicate that infant mortality is higher in HK region than the rest of Karnataka [1]. Socio economic factors such as income, alcohol consumption, and anemia have a statistically significant influence on the infant mortality. A limitation of the study is that the data reported may not be as comprehensive as that of Census bureau or SRS data and hence interpretation should be done accordingly.

The rest of the study is organized as follows. Section on Data and Methodology discusses the definitions of variables used, and the methodology of analysis and estimation. Section on Results presents the results and conclusions obtained in this study [2].

2. Literature Survey

Infant Characteristics such as sex of the baby, infant birth weight are significant determinants. Low infant birth weight is found to be positively correlated to IMR [3]. Infant mortality of girls is found to be lesser than that of infant boys throughout the world. However, India has higher mortality for girls than boys [4].

Maternal health and postnatal care depend on price and income; such variables influence all health inputs and consumption choice, but do not directly effects on mortality. Mother age at birth, fertility, smoking, breast feeding, employment, and medical care are significantly influence of infant mortality [5].

3. Data and Methodology

This study uses a district level covering panel data set nine year period from 2008 to 2016. The dependent variable is infant mortality which is the total number of infant deaths reported during the study period. Minimum of 2 was observed in Bangalore Rural during 2011-12 and a maximum of 1515 was observed in Bellary during 2008-09, with a mean of 237 in infant mortality is observed in the data sample. Independent variables in this study include Number of mothers with anemia (coded as A12 – with Hemoglobin levels less than 11mg, A13 – with Hemoglobin levels less than 7mg), Number of Home deliveries with attendants without proper training (coded as A18), Number of newborns with birth weights less than 2.5 kg (coded as A50), Sex Ratio at Birth which is a ratio of female live births to male births times 1000, Variables capturing Post National care and Immunization (coded A61, and A122 respectively), Per capita Gross District Domestic Product calculated in Rupees (2011 constant Prices), Dummy variable which takes value of 1 when the district belongs to HK region or 0 otherwise (coded as hyka), State Excise revenue collections from alcohol sales (coded as revenue), in nominal prices, presented in crores of rupees. Maximum revenues were reported from Bangalore Urban followed by Bellary district. Minimum Excise revenues were observed in Mandya district during 2009.

4. Summary

Descriptive statistics on the independent variables are presented in Table 1.

$$y = X\beta + \varepsilon \qquad \text{Equation 1}$$

Equation 1 is estimated with data pooled over time and cross section. Dependent Variable y is Infant mortality and X is the vector of independent variables as described above. β is the parameter vector and ε is the error term. Estimation is done by Least Squares with heteroscedasticity consistent Whites estimates for co-variances. Model diagnostics such as normality tests, autocorrelation tests were calculated. Multicollinearity was diagnosed using Variance Inflation Factors (VIFs). VIF value greater than 10 is an indicator of multicollinearity. Estimation was done in *SAS* using Base *SAS* and *SAS SQL* routines.

Table 1. Descriptive statistics on select variables

Variable	Description	N	Minimum	Maximum	Mean	Std. Dev
A154	Total Number of Infant Deaths reported	138	2	1515	237.19	253.46
A12	Number having Hb level<11 (tested cases)	137	504	119953	20814.52	18965.15
A13	Number having severe anaemia (Hb<7) treated at institution	137	36	13912	1660.19	1865.23
A18	Number of home deliveries attended by Non SBA trained (trained TB/Dai)	138	2	26647	977.51	2578.51
A50	Number of Newborns having weight less than 2.5 kg	138	264	16387	3419.58	2969.16
A56	Sex Ratio at birth (Female Live Births/ Male Births *1000)	140	0	1038	924.51	115.43
A61	% Post - Natal Care / PNC maternal complications attended to Total Deliveries	138	0	24.6	0.91	2.15
A122	% Immunization Sessions where ASHAs were present to Immunization Sessions Planned	137	0	108.5	51.41	30.79
GDDP	Per Capita District Domestic Production Rupees	139	24122	202340	52728.07	28930.31
hyka	Dummy Variable. Value=1 if district belongs to Hyderabad Karnataka Region	140	0	1	0.21	0.41
Revenue	Gross Revenue of State Excise from Alcohol Sales in Crores of Rupees	138	1.76	4245.77	314.71	773.35

Parameter estimate of the independent variables on variable *hyka* is hypothesized to be positive, as the region is developmentally backward. Parameter estimate on Excise revenue is hypothesized to be positive, as the revenue is instrumental variable for quantity of alcohol consumed. Consumption of alcohol is presumably done by male member of family, reduces the available income for consumption for the rest of the family members. This could affect the mother's health and thus affecting infant mortality. Parameter on per capita GDDP is expected to be negative, as higher the income, better the living conditions. Signs of parameter estimates on mother's health such as anemia are expected to be positive and Post natal care variables to be negative.

5. Results

Parameter estimates from the estimated model are presented in Table 2. Parameter estimate on dummy variable representing Hyderabad Karnataka region is positive and significant as hypothesized. This indicates that HK region recorded more infant mortality even after controlling for socioeconomic factors. Parameter estimate on Per Capita income of district (GDDP per capita) is negative and significant at slightly higher p-value. The sign is as hypothesized. The parameter estimate on low birth weight is positive and highly significant indicating the increase in mortality with low birth weight. Factors such as diseases (diarrhea) affecting the infant post-partum are also significant statistically and show sign as expected. Alcoholism was not statistically significant. Sex ratio of the child also turned out to be statistically insignificant.

Table 2. OLS estimates from the model data pooled over time

Variable	Parameter Estimate	Pr > |t|	VIF
Intercept	-402.60747	0.4215	0
A12	-0.00351	0.0064	2.5369
A13	0.01531	0.1828	2.0032
A18	0.00449	0.5131	1.3851
A50	0.03913	<.0001	1.5958
A56	0.72959	0.1678	1.0453
A61	38.23262	<.0001	1.0999
A122	-2.01563	0.0009	1.4792
GDDP	-0.00172	0.0645	3.1532
Hyka	119.73503	0.0056	1.3057
REVENUE	0.03122	0.6887	14.6070
Revsqr	-0.00001596	0.4233	12.6795
Adj R-Sq	0.5231		
Dependent Var	Infant Mortality		

6. Conclusion

This study finds evidence in regional imbalances in terms of developmental indicators such as Infant Mortality Rate. Family welfare data spanning over nine years from 2008 to 2016 was analyzed using regression techniques and results from our model indicate that statistically significant differences exist between Hyderabad Karnataka region and rest of Karnataka after controlling for social and economic factors affecting infant mortality. Increases in per capita district income result in decreased infant mortality. Low birth weight of infant is also a statistically significant factor affecting infant mortality. Sex ratio at birth was not found to be statistically significant factor. The results from our model can be used for regional planning and development.

7. References

1. Economic Survey of Karnataka, Government of Karnataka. http://karenvis.nic.in/Content/EconomicSurveyKarnataka_8184.aspx. Date accessed: 28/03/2018.
2. Health Management Information System, A digital initiative under National Health Mission. Ministry of Health and Family Welfare.https://www.who.int/india/news/detail/30-06-2019-mohfw-launches-new-real-time-health-management-information-system-online-portal-in-five-states. Date accessed: 30/06/2019.
3. C. Lau, N. Ambalavanan, H. Chakraborty, M.S. Wingate, W.A. Carlo. Extremely low birth weight and infant mortality rates in the United States. *Pediatrics.* 2013; 131(5), 855–60.
4. B. Antonisamy, P.S. Rao, M. Sivaram. Changing scenario of birthweight in south India. *Indian Pediatric*. 1994; 31(8), 931–7.
5. M.R. Rosenzweig, T.P. Schultz. Consumer demand and household production: the relationship between fertility and child mortality. *The American Economic Review*. 1983; 73(2), 38-42.