MULTIVARIATE HAZARD ANALYSIS FOR THE DETERMINANTS OF CHILD MORTALITY USING NFHS-3 DATA

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ABSTRACT: Child mortality refers to the death of infants and children under the age of five or between the ages of one month to four years. In India the child mortality rate per 1000 live births was 248 in 1960 which has declined to 48 in 2015. It is essential to assess the factors responsible for reduction by a factor of five so that better measures can be adopted to still bring down further. This study examines the relevance of some of the determinants. These determinants include socio-economic, biological and demographic factors such as mother's age, residence, religion, age at first marriage, birth order, sex of infant and birth weight that may affect the child mortality. It is of interest to model these risk factors using multivariate hazard analysis. The data from National Family Health Survey which is the most potential source providing information about 256782 ever married women in the reproductive age of 15 to 49 years has been taken for the evaluation. The analysis reveals that mother's age, birth order and age at first marriage are the most influencing factors for child mortality.

Key words: Child mortality, Survival time, Multivariate hazard, NFHS

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INTRODUCTION
The first five years of life are the most crucial to the physical and intellectual development of children. This determines their potential to learn and thrive for a life time. Although infant and child mortality rates are reduced to greater extent by 2006, it still remains a major public health issue in South Asian countries particularly in India.

PURPOSE
Analyze the covariates of infant and child mortality in India and particularly in the state of Sikkim using the NFHS 2005-06 data.

METHOD
A retrospective study of 388 ever married women in the reproductive age of 15 to 49 years of Sikkim between the year 2005-06 was taken from NFHS-3. The socio-economic, biological and demographic factors such as mother's age, residence, religion, age at first marriage, birth order, and sex of infant and birth weight that may affect the child mortality in the available data were analyzed using multivariate hazard model. Statistical decisions were taken on a significance level of 5 %(p≤0.05).

RESULTS AND DISCUSSION
The Cox's proportional hazard regression model (Multivariate hazard model) is fitted to the data along with 5 covariates. The purposeful selection of variables and fix for a best subset of the covariates out of these 5 covariates has been conducted by stepwise method (Wald's forward) with p-value 0.05 for entry level of a covariate in the model and 0.10 for deletion level of a

covariate in the model. For assessing the best fit of the model particularly model coefficients, overall model and goodness of fit are conducted by Wald's test, likelihood ratio test and score test. From this analysis, further, interpretation of the effects of covariates on the survival status of child is made with the help of relative risks of each covariate.

Cox proportional hazard model is

$$h(t|X) = h(t) \exp(X1\beta1 + \cdots + Xp\beta p)$$

Where,

• The predictors, X1, . . . , Xp are assumed to act additively on log h(t|x).

• log h(t|x) changes linearly with the βs.

• The effect of the predictors is the same at all times t.

Table1: Omnibus Tests of Model Coefficients

Step	-2 Log Likelihood	Overall (score)			Change From Previous Step			Change From Previous Block		
		Chi-square	df	Sig.	Chi-square	df	Sig.	Chi-square	df	Sig.
1[a]	3980.081	9.135	1	.003	9.399	1	.002	9.399	1	.002
2[b]	3971.661	15.927	2	.000	8.420	1	.004	17.819	2	.000
3[c]	3939.636	42.408	3	.000	32.025	1	.000	49.844	3	.000

a. Variable(s) Entered at Step Number 1: MothersAge

b. Variable(s) Entered at Step Number 2: Age during Marriage

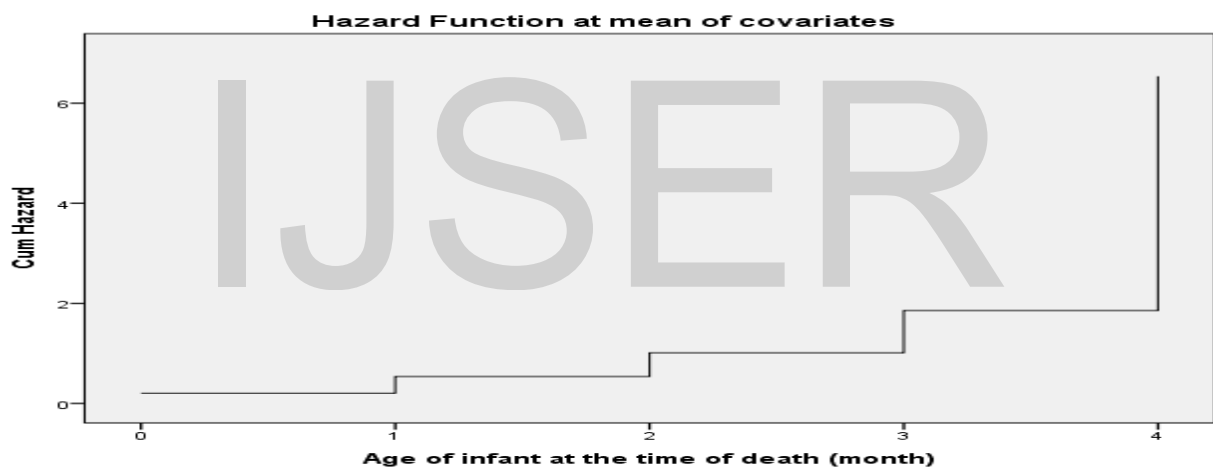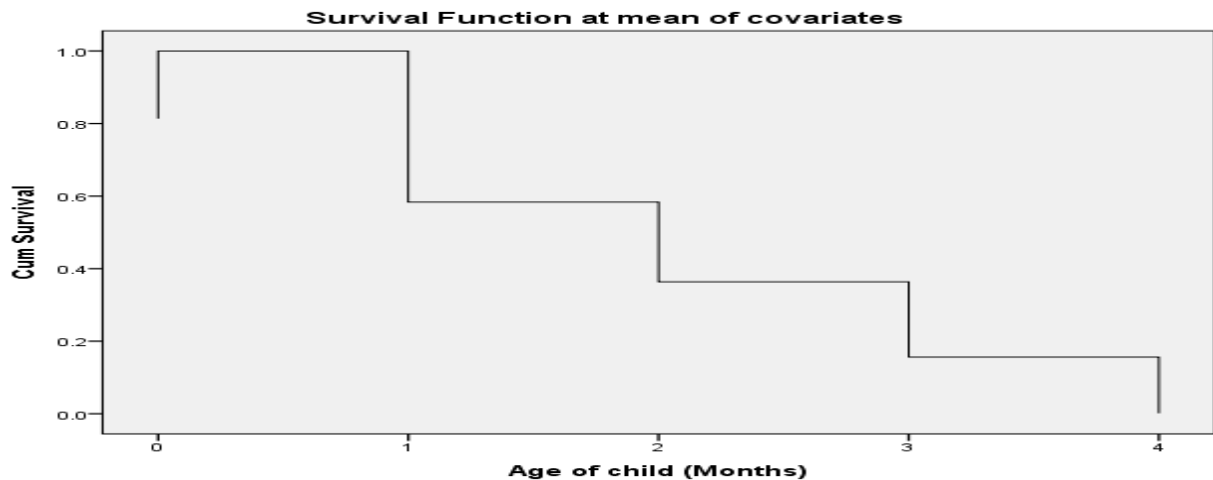c. Variable(s) Entered at Step Number 3: Birth Order

d. Beginning Block Number 1. Method = Forward Stepwise (Wald)

 Table1 depicts the Omnibus test for model coefficients of in 3 steps of the analysis. It has been confirmed from the score tests which are statistically significant for all possible 6 models and thus overall coefficients of the models up to 3 steps are significant.

Table2: Cox's Regression Analysis of Survival Time of Child by Stepwise Method

		B	SE	Wald	df	Sig.	Exp(B)
Step 1	Mothers age	-.031	.010	9.109	1	.003	.969
Step 2	Mothers age	-.059	.015	15.800	1	.000	.942
	Age during marriage	.048	.017	8.040	1	.005	1.049
Step 3	Mothers age	-.167	.026	42.893	1	.000	.846
	Birth Order	.446	.077	33.827	1	.000	1.562

	.159	.027	34.687	1	.000	1.172
Age during marriage						

Survival Function at mean of covariates

Hazard Function at mean of covariates

CONCLUSION
- The analysis reveals that mother's age, birth order and age at first marriage are the most influencing factors for child mortality.
- From the data we could say that if the birth order is less than 4, the probability of child being alive is high.
- The age during marriage should be between 18 to 24 years and the mother's age should be from 20 to 32 years , so that we could reduce the child mortality rate to a greater extent.

REFERENCES
- Salam Shantikumar Singh , Application of Cox's Proportional Hazard Model and Construction of Life Table for Under-Five, International Journal of Statistics in Medical Research, 2014, Vol. 3, No. 2
- Dr. Phrangstone Khongji The Nfhs-3 Data On Infant And Child Mortality In Meghalaya, NEHU Journal (2012), Vol X(2), 15 – 31.