ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol.3, Issue, 6, pp.118-122, June, 2011

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

ESTIMATING CHILD MORTALITY THROUGH PROPORTION OF DEAD CHILDREN AMONGST CHILDREN EVER BORN TO FEMALES OF A SPECIFIED MARITAL DURATION

[1]Sushil Kumar Yadav, [2]Mahendra Pratap and [3]Anup Kumar

[1]Department of Statistics, Banaras Hindu University, Varanasi-221005
[2]Department of Statistics, U.P.College, Varanasi
[3]Centre for Interdisciplinary Mathematical Sciences, Department of Statistics, Banaras Hindu University

ARTICLE INFO

Article History:
Received 1st March, 2011
Received in revised form
5th April, 2011
Accepted 7th May, 2011
Published online 2nd June 2011

Key words:
Infant Mortality rate,
Child death rate.

ABSTRACT

The estimate of Infant Mortality rate and Child death rate are always required to policy makers of every country's government for further planning to improve the health status of children and check the validity of present plans. Usually the data for such measures are available from the system of civil registration. However the quality of registered data especially in underdeveloped countries is inadequate both in content and coverage. So we need some indirect techniques to estimate these demographic parameters. The term ''indirect estimation'', used to qualify some of the techniques in demography, has its origin in the fact that such techniques produce estimates of certain parameters on the basis of information that is only indirectly related to its value. In this paper we have proposed a technique for the estimation of child mortality from observations on proportion of dead children amongst children ever born in a specified group of marital duration of currently married females using the data provided in NFHS-III and NFHS-II .The whole idea is based on regression analysis. The method is simple and the data requirements are also less.

INTRODUCTION

Infant mortality Rate (IMR) and Under five child mortality rate (UFCMR) are important indicators of a social development of a nation .It is widely used for assessing socio –economic and health situation in developing countries like India, most of its population belongs to rural area and approximately 35% of its adult population is illiterate according Indian census 2001. IMR and UFCMR are measured as the number of deaths of infants under one and children under five years of age per 1000 live births. Live birth refers to the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which, after such separation, breathes or shows any other evidence of life - e.g. beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles - whether or not the umbilical cord has been cut or the placenta is attached. Each product of such a birth is considered live born. However, the measurement is a fundamental aspect of research in area of child mortality. These measures (IMR and UFCMR) require complete information about date of interview, date of birth, survival status and age at death of the child. There is no good coverage of information on vital events; non-response and memory biases normally occur in each type of surveys. So, various indirect methods to estimate the vital events are given in literature. The term ''indirect estimation'', used to qualify some of the techniques in demography, has its origin in the fact that such techniques produce estimates of certain parameters on the basis of information that is only indirectly related to its value.

Brass (1964) introduced an indirect method to estimate the child mortality from proportion of children dead amongst total children ever born (PCDTCEB) in specific age groups of married females. This technique is known as an indirect method to estimate the child mortality through PCDTCEB. Brass successfully operated it on the historical data. Many other researchers (Brass 1975, Sullivan 1972, Trussell 1975) also successfully utilized the indirect methods on different data sets. Pallani (1978, 79) presented an alternative technique for the case in which mortality has been declining. Sullivan (1972) used a technique for estimating child mortality from observations on proportion of dead children amongst children ever born to women according to duration of marriage. Islam and Alam (1996) computed child mortality by using child mortality index (M I) and many other researcher also contributed recently some new methodologies .Brass method is probably the main source of origination of all the above methods.

***Corresponding author:** sush.stats@gmail.com

Objective of the present paper is to estimate the IMR and UFCMR through the PCDTCEB in a specified marital duration group of currently married females as Brass did the same for specified age groups of females. The choice of the marital duration in our study because of the country like India where the social cultural systems are so strong, the PCDTCEB to females depend upon marital durations of married females slightly on the age of female's .It is also noticeable that age misreporting has more chance in comparison to duration misreporting. So we try to estimate the UFCMR and IMR through PCDTCEB to females of a specified marital duration group .While Brass estimate UFCMR and IMR with the help of two specified age groups of females consequently.

MATERIALS AND METHODS

For the above process we selected that marital duration of females which have less risk of memory biasness as well as it has no effect of digit preference. For further analysis, we utilized the data on marital durations of females provided in National Family Health Survey. The National Family Health Survey (NFHS) is a large-scale, multi-round survey conducted in a representative sample of households throughout India. The National Family Health Survey 2005-2006 (NFHS-3) is the third in a series of national surveys. Earlier NFHS surveys were carried out in 1992-93 (NFHS-1) and 1998-99 (NFHS-2). All three surveys were conducted under the chairmanship of the Ministry of Health and Family Welfare, Government of India, with the International Institute for Population Sciences, Mumbai, serving as the nodal agency. In NFHS-1, 2&3 the data on the marital durations of females were divided in seven groups according the female's marital durations at the date of interview. These seven groups are 0-4, 5-9, 10-14, 15-19, 20-24, 25-29 and 30^{+} years. We involve currently married females of 0-4 and 5-9 years marital duration's, as the higher marital duration's females have more chance of memory biases. Merging the currently married females of marital duration 0-4 and 5-9 years (provided in NFHS-1, NFHS-2 and NFHS-3), a group of marital duration 0-9 years of females are obtained. The PCDTCEB to females of marital duration 0-4 years is not considered due to less data and greater then marital duration 0-9 years not considered because of memory biases and states for which estimation are made, selected according to the availability of data(less than 125 females is not considered and Assam is also excluded from study due to non reliable data in NFHS-2).

Further we empirically define a simple linear relationship between child mortality and PCDTCEB to females of marital duration 0-9 years through regression technique. Regression analysis is a mathematical measure of the average relationship between two or more variables in terms of the original units of data. In the regression analysis there are mainly two categories of variables. The variable whose values are influenced or to be predicted is called dependent variable and the variable which influence the values of the dependent variable are called independent variable. In regression analysis independent variables are also known as predictor variables while the dependent variable is also known as regressed variable. In our study PCDTCEB to females of marital duration 0-9 years is predictor variable and child mortality is regressed variable. A simple statistical regression linear relationship established between PCDTCEB of different marital duration to females and child mortality of specific group of children, the regression line of form given below is established for prescribed marital duration of females

$Y= \beta X+ \alpha$ Where β & α are constants.

Here Y is child mortality taken as dependent variable. X is taken as Independent variable as proportion of children dead amongst total children ever born (PCDTCEB), Table 1 representing the regression lines with corresponding R^2-value. R^2, the coefficient of regression, telling the goodness of fit of relationship between predictor (PCDTCEB) provided in Table 2, Table 3 and Table 4 and dependent variable (IMR or UFCMR) .As the value of R^2 is tending to one as we may say relationship is good. In our cases R^2 are greater than .9 in each case. In Table 1 the regression lines and R^2 for UFCMR and IMR in respect of NFHS-1, NFHS-2 & NFHS-3 are provided.

Table 1: Representing the different regression lines and R^2 for UFCMR and IMR in respect of NFHS-1, NFHS-2 & NFHS-3

$Y= \beta X+ \alpha$ & R^2	NFHS-1	NFHS-2	NFHS-3
For Under five mortality rate			
β	1036	1052	1068
α	-9.295	3.873	-4.004
R^2	0.945	0.966	0.974
For Infant mortality rate			
β	700.3	650.1	723.3
α	-0.826	12.1	4.028
R^2	0.926	0.924	0.976

RESULTS AND DISCUSSIONS

It is essential that model fitted for estimation purposes should satisfy the important tests of model accuracy. In this study, diagnostic checking for models accuracy are completed by applying ,these in Indian context to estimate IMRs and UFCMRs to other estimated IMRs and UFCMRs available for it in same period for which estimation are made. A cut-off point of 10% difference between the observed and estimated values of UFCMR and IMR are used to judge the adequacy of the proposed method. From above criterion checking the adequacy of model obtain fromNFHS-1, NFHS-2 and NFHS-3 data, and the estimates for the Indian and its states context, we conclude from table 5 for UFCMR, the sixteen values out of nineteen (India 3.9%,Andra Pradesh 9%, Assam 4.8%,Gujrat 0.3%, Haryana 5.4%, Karnataka 8.9%, Madhaya Pradesh 5.6%, Maharashtra 6.9%, Orissa 5.6%, Punjab 0.0%, Rajasthan 1.8%, Tamil Nadu 1.3%, West Bengal 4.7%, Uttar Pradesh 3.1%, Jammu 2.5% and New Delhi 1.0%) are under the cutoff point. And three values (Bihar 13.5%, Kerala 29.5% and Himachal Pradesh 12.8%) are out off the cut-off point. For estimating IMR the fourteen values(India 2.6%,Andra Pradesh 3.2%, Assam 9.3%, Haryana 3.4%, Karnataka 6.6%, Madya Pradesh 4.0%, Punjab 4.2%, Rajasthan 4.8%,Tamil Nadu 4.4%,West Bengal 0.6%, Uttar Pradesh 1.9%, Himachal Pradesh 4.2%, Jammu 2.2% and New Delhi 6.6) are under the cut-off point and five values (Bihar 10.3%,Gujrat 10.6%,Kerla 13.0%,Maharashtra 11.4%,Orissa 11.70%) are out of cut-off point. And from table 6 for UFCMR, fifteen values (India 5%, Andhra Pradesh 1.3 %, Bihar 1.8%,Gujarat 8%, Jammu 3.9%,Karnataka 1.3%, Madhaya Pradesh 1.0%,Maharastra 1.8%, Orissa 9.5%, Punjab 5.6%, Rajasthan 1.1% ,Tamil Nadu 4.2%, west Bengal 8.5 % Uttar Pradesh 0.5%, and New Delhi

Table 2: Representing the PCDTCEB in the married females of marital duration 0-9 years provided in NFHS-1.

Regions	PCDT CEB	No. of females
India	0.1103	30228
Andhra Pradesh	0.1049	2020
Assam	0.1396	904
Bihar	0.1154	2907
Gujarat	0.1097	1594
Haryana	0.1094	762
Karnataka	0.1007	1707
Kerala	0.0307	901
Madhya Pradesh	0.1277	2374
Maharashtra	0.0815	3095
Orissa	0.1425	1112
Punjab	0.0746	809
Rajasthan	0.1098	1367
Tamil Nadu	0.0936	1949
West Bengal	0.1093	2273
Uttar Pradesh	0.1411	5339
New Delhi	0.0884	366
Himachal Pradesh	0.0842	213
Jammu	0.0646	143

Table 3: Representing the PCDTCEB in the currently married females of marital duration 0-9 years provided in NFHS-2.

Regions	PCDTCEB	No. of females
India	0.082	34344
Andhra Pradesh	0.0786	2870
Bihar	0.0944	3540
Gujarat	0.0707	1653
Haryana	0.0592	635
Jammu	0.0695	262
Karnataka	0.0636	1842
Kerala	0.0228	1156
Madhya Pradesh	0.1284	2624
Maharashtra	0.0506	3171
Orissa	0.105	1215
Punjab	0.0687	766
Rajasthan	0.1044	1818
Tamil Nadu	0.054	2395
West Bengal	0.0661	2911
Uttar Pradesh	0.1122	5506
New Delhi	0.0487	417

Table 4: Representing the PCDTCEB in the currently married females of marital duration 0-9 years provided in NFHS-3

Regions	PCDTCEB	No. of females
India	0.0704	36190
Jammu and Kashmir	0.0519	292
Himachal Pradesh	0.0464	204
Punjab	0.0507	878
Uttaranchal	0.0527	263
Haryana	0.0505	658
Delhi	0.0471	378
Rajasthan	0.0796	1942
Uttar Pradesh	0.0913	5537
Bihar	0.0841	3131
Assam	0.088	1012
West Bengal	0.0571	3287
Jharkhand	0.0903	1065
Orissa	0.0823	1361
Madhya Pradesh	0.0958	2018
Gujarat	0.0633	1803
Maharashtra	0.0482	3470
Karnataka	0.0607	2175
Kerala	0.0188	1010
Tamil Nadu	0.0372	1820
Andhra Pradesh	0.0674	2645

Table 5: Estimated and observed under five children and Infant mortality rate for India and its states for NFHS-1.

	Under five Children mortality rate			Infant mortality rate		
Regions	Observed	Estimated	Difference	Observed	Estimated	Difference
India	109.3	105	3.9	78.5	76.45	2.6
Andhra Pradesh	91.2	99.39	9.0	70.4	72.64	3.2
Assam	142.2	135.3	4.8	88.7	96.93	9.3
Bihar	127.5	110.3	13.5	89.2	79.98	10.3
Gujarat	104	104.4	0.3	68.7	76	10.6
Haryana	98.7	104	5.4	73.3	75.76	3.4
Karnataka	87.3	95.06	8.9	65.4	69.71	6.6
Kerala	32	22.55	29.5	23.8	20.7	13.0
Madhya Pradesh	130.3	123	5.6	85.2	88.58	4.0
Maharashtra	70.3	75.13	6.9	50.5	56.24	11.4
Orissa	131	138.3	5.6	112.1	98.96	11.7
Punjab	68	68	0.0	53.7	51.42	4.2
Rajasthan	102.6	104.5	1.8	72.6	76.08	4.8
Tamil Nadu	86.5	87.63	1.3	67.7	64.69	4.4
West Bengal	99.3	103.9	4.7	75.3	75.72	0.6
Uttar Pradesh	141.3	136.9	3.1	99.9	97.98	1.9
Himachal Pradesh	69.1	77.91	12.8	55.8	58.12	4.2
Jammu	59.1	57.63	2.5	45.4	44.41	2.2
New Delhi	83.1	82.31	1.0	65.4	61.09	6.6

Table 6: Estimated and observed under five children and Infant mortality rate for India and its states NFHS-2.

	Under five Children mortality rate			Infant Mortality Rate		
Regions	Observed	Estimated	Difference	Observed	Estimated	Difference
India	94.9	90.17	5.0	67.6	64.43	3.2
Andhra Pradesh	85.5	86.59	1.3	65.8	63.22	3.9
Bihar	105.1	103.17	1.8	72.9	73.46	0.8
Gujarat	85.1	78.26	8.0	62.6	58.07	7.2
Haryana	76.8	66.11	13.9	56.8	50.56	11.0
Jammu	80.1	77.01	3.9	65	57.29	11.9
Karnataka	69.8	70.74	1.3	51.5	53.42	3.7
Kerala	18.8	27.84	48.1	16.3	26.91	65.1
Madhya Pradesh	137.6	138.98	1.0	86.1	95.29	11.0
Maharashtra	58.1	57.07	1.8	43.7	44.98	2.9
Orissa	104.4	114.29	9.5	81	80.33	0.8
Punjab	72.1	76.10	5.6	57.1	56.74	0.6
Rajasthan	114.9	113.67	1.1	80.4	79.95	0.6
Tamil Nadu	63.3	60.67	4.2	48.2	47.20	2.1
West Bengal	67.6	73.38	8.5	48.7	55.05	13.0
Uttar Pradesh	122.5	121.95	0.5	86.7	85.06	1.9
New Delhi	55.4	55.08	0.6	46.8	43.74	6.5

Table 7: Estimated and observed under five children and Infant mortality rate for India and its states for NFHS-3

	Under five children mortality rate			Infant mortality rate		
Regions	observed	Estimated	Difference	observed	Estimated	Difference
India	74.5	71.20	4.4	57	54.96	3.6
Jammu and Kashmir	51.2	51.41	0.4	44.7	41.56	7.0
Himachal Pradesh	41.5	45.58	9.8	36.1	37.61	4.2
Punjab	52	50.10	3.6	41.7	40.67	2.5
Uttaranchal	56.8	52.24	8.0	41.9	42.12	0.5
Haryana	52.3	49.97	4.5	41.7	40.58	2.7
Delhi	46.3	46.35	0.1	39.8	38.13	4.2
Rajasthan	85.4	80.97	5.2	65.3	61.58	5.7
Uttar Pradesh	96.4	93.53	3.0	72.7	70.08	3.6
Bihar	84.8	85.79	1.2	61.7	64.84	5.1
Assam	85	89.96	5.8	66.1	67.66	2.4
West Bengal	59.6	56.95	4.5	48	45.31	5.6
Jharkhand	93	92.48	0.6	68.7	69.37	1.0
Orissa	90.6	83.92	7.4	64.7	63.57	1.7
Madhya Pradesh	94.2	98.27	4.3	69.5	73.29	5.5
Gujarat	60.9	63.60	4.4	49.7	49.81	0.2
Maharashtra	46.7	47.51	1.7	37.5	38.92	3.8
Karnataka	54.7	60.81	11.2	43.5	47.92	10.2
Kerala	16.3	16.12	1.1	15.3	17.66	15.4
Tamil Nadu	35.5	35.76	0.7	30.4	30.96	1.8
Andhra Pradesh	63.2	67.96	7.5	53.5	52.76	1.4

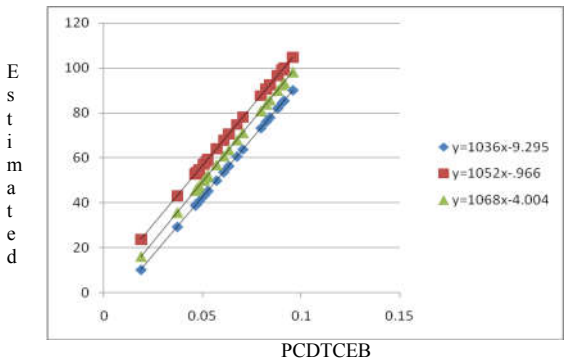

Fig. 1: Comparison of regression lines obtained from NFHS-1, NFHS-2 and NFHS-3 Data, applying these lines on NFHS-3 data to estimate under five children mortality rate.

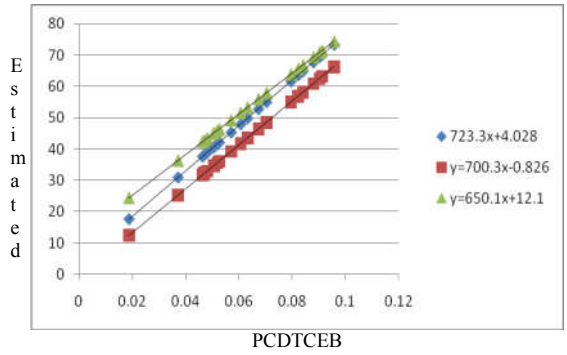

Fig. 2: Comparison of regression lines obtained from NFHS-1, NFHS-2 and NFHS-3 Data, applying these lines on NFHS-3 data to estimate Infant Mortality rate.

0.6%) out of seventeen are under control. Only Haryana 13.9% and Kerala 48.1% not come under this criterion. On the other side to estimate the IMR, the twelve values (India 3.2%, Andhra Pradesh 3.9%,Bihar 0.8%,Gujarat 7.2 %,Karnataka 3.7%,Maharastra 2.9%,Orissa 0.8%,Punjab 0.6 %,Rajasthan 0.6%,Tamilnadu 2.1%,Uttar Pradesh 1.9%, and New Delhi 6.5 %) out of seventeen under control and five values (Haryana 11.0%,Jammu 11.9%,Madhya Pradesh 11.0% , west Bengal 13.0% and Kerala 65.1%) are out- off cut –off point.

Similarly from Table 7 for UFCMR twenty estimates(India 4.4%,Jammu and Kashmir 4%, Himachal Pradesh 9.8%, Punjab 3.6%,Uttranchal 8.0%, Haryana 4.5%, Delhi .1%, Rajasthan 5.2%, Uttar Pradesh 3.0 %, Bihar 1.2%, Assam 5.8%, West Bengal 4.5%, Jharakhand 0.6%, Orissa 7.4%, Madhaya Pradesh 4.3%, Gujarat 4.4%, Maharastra 1.7%, Kerla 1.1%, Tamil Nadu 7%, Andhra Pradesh 7.5%) are under the criterion of 10% ,one estimates (Karnataka 11.2%) is above 10% . And for infant mortality rates nineteen (India 3.6%, Jammu and Kashmir 7.0%, Himachal Pradesh 4.2%, Punjab 2.5%, Uttranchal 0.5%, Haryana 2.4%, Delhi 4.2%, Rajasthn 5.7%, Uttar Pradesh 3.6%, Bihar 5.1%, Assam 2.5%, West Bengal 5.6%, Jharkhand 1.0%,Orissa 1.7%,Madhaya Pradesh 5.5%, Gujarat 0.2%, Maharastra 3.8%, Tamil Nadu 1.8%, Andhra Pradesh 1.4%) are under the criterion 10% ,and only Karnataka 10.2% and Kerala 15.4% are above the 10% criterion .Now we can say on the basis of above discussions regression lines are suitable to estimate UFCMR and IMR .

For eloquent the trends of regression lines over three periods of time (NFHS-I, NFHS-II and NFHS-III) we compare the lines obtained for estimating UFCMR on the basis of PCDTCEB of NFHS-III in Figure 1 and in Figure 2 the lines obtained for IMR are compares in same way. From seeing the Figure 1 we may say that over time regression lines are different in slopes and comparing the regression lines of the Figure 2 we interpret it as the slope between NFHS-II and NFHS-III is not much different but NFHS-I regression line is rather different from these two. Similarly PCDTCEB of NFHS-I and NFHS-2 also used to check the trends of regression lines over time. So we may conclude that proposed technique seems good for estimating under five mortality rate and Infant mortality rate.

REFERENCES

Pallani , A. 1978. Application of indirect Technique to study Group differentiation in infant mortality .pp 283-300.In Frank Bean and Parker Frisbi (eds.) ,Demography of Racial and Ethnic Groups Newark Academic Press.

Trussell, J.1975: “A Re-estimation of the Multiplying factors for the Brass Technique for determining childhood survivorship Rate."

Brass, W. 1968. Methods of analysis and estimation. In W. Brass etal. (eds)”, The Demographic of Tropical Africa, Princeton, Princeton University Press.

Brass, W. and Coale, A. J. 1968. Methods of analysis and estimation”, William Brass et al (eds). The Demography of Tropizal Africa, Princeton: Princeton University Press, pp. 88-155.

Palloni, A. 1978. Application of an Indirect Technique to Study Group Differentialism in infant Mortality. Pp. 283-300 In Frank Bean and Parker Frisbie (eds.), Demography of Racial and Ethnic Groups Newark Academic Press.

Sullivan, J. 1972. Models for the Estimation of the Probability of Dying Between Birth and Exact Age of Early Childhood. Population Studies Vol. 26, pp. 79-98.

Zlotnik , H. and Hill, K.1981. The use of hypothetical cohorts in estimating demographic parameters under conditions of changing fertility and mortality, Demography, 18:pp.103-122.

****