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Analysis of Birth Weight Using Equilibrium State

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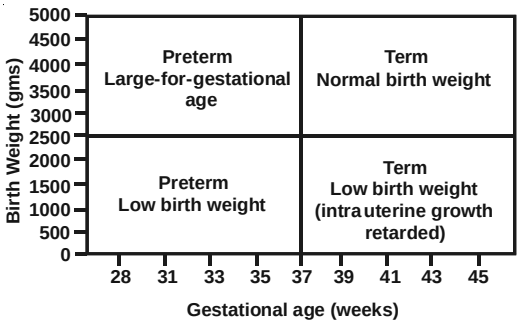
ABSTRACT During the past three decades the researcher much attention about birth weight of new born babies. The growth of birth weight is indication of good health for babies. The object of this paper analyses the birth weight using Markov model. The data were collected from general government hospital Nagercoil and Chennai. The birth weight is one of the vital roles in the health of new born babies.

INTRODUCTION

Pregnancy is a natural state. The families take special good care of pregnant woman health to get a healthy baby. Low birth weight is defined as a birth weight of <2500 g (51lb, 80z). Birth weight is of public health importance because it is closely related with infant mortality and morbidity. Kiely et al. (1995) suggest a classification scheme for birth weight and gestational age, which is as given below:



A good health throughout childhood, adolescence, adult life and pregnancy is necessary for a successful reproduction. The good health of the mother can be sustained in terms of physical and mental health and it helps to evaluate the effect of maternal weight and maternal height on the outcome of pregnancy. Haemoglobin count levels of the mothers, age and gestation are also influence the outcome of pregnancy.

The weight of the newborn babies at birth is known to be affected by the intrauterine environment (Bartholomew, 1973; Kemeny, 1974; Mizrahi, 1979; Bhatia and Tyagi, 1984; and Tyagi and Bharambe, 1994). Subsequently, weight at birth affects the survival of the babies during their early life. There are numerous studies in support to the weight at birth, which determines the future course of their life. The relationship between calorie intake and weight gain in pregnancy is well established. The poor weight gain vis-a-vis low calorie intake is associated with low birth weight. Where as, an abnormally high weight gain goes with calorie intake and is associated with an increased incidence of pre-eclampsia. Female <17 years of age and >34 years of age are at increased risk of low birth weight delivery. The various biological factors may likely to produce low birth weight babies. The aim of this paper is analyzing the birth weight of baby using Markov Chain model. The purpose of this paper is to estimate for health for baby in future.

METHODOLOGY

Data obtained from the Government general hospital, Nagercoil and Government general hospital, Chennai on 500 live birth babies upto one year along with their pregnant mothers are analysed and presented in each. The data were collected during 1st January 2004 to December 2004. The both hospital are well equipped and all the records are maintain periodically.

RESULTS

Model of Birth Weight - I

From the table 1 the highest frequency of the birth weight is the state 3-4 to >5 . Almost all the babies are increased in birth weight.

After sufficient long time the highest proba-

Table 1: Birth weight of the babies (at the end of one year)

Birth weight (kgs)	*<3*	*3-4*	*4-5*	*>5*
<3	2	7	15	12
3-4	3	10	81	174
4-5	1	10	14	125
>5	0	5	15	26

$$P = \begin{bmatrix} .0556 & .1944 & .4167 & .3333 \\ .0112 & .0373 & .3022 & .6493 \\ .0067 & .0667 & .0933 & .8333 \\ 0 & .1087 & .3261 & .5652 \end{bmatrix}$$

$\lim_{n\to\infty} P^n$ = (.0029, 0.0914, 0.2630, 0.6427)

Table 2: Comparison of expected and actual distribution

Birth weight (kgs)	*Observed Frequency*	*Expected Frequency*
<3	6	1.45
3-4	32	45.7
4-5	125	131.5
>5	337	321.35

bility is 0.6427 in the state 4kgs. 0.2630,0.0914 and 0.0029 has the probability state 4-5kgs ,3-4kgs and <3kgs respectively. The above result reveals that at the time of baby birth weight is <3kgs after one year it will increases >5kgs.

H_0: No significance difference between the expected and observed frequencies for birth weight of babies has been observed (Table 2), and a χ^2 test of goodness of fit with 3 degree of freedom when

$$\chi^2 = \sum_{I=1}^{4} \frac{(O-E)^2}{E} 19.46$$

the tabulated at 5% level of significance with 3 degree of freedom is 7.815. The null hypothesis is not accepted. Therefore there is significance difference between the expected and observed frequencies for birth weight of babies.

Model of Birth Weight – II

From the table 3 the highest frequency of the birth weight is the state 3-4 to >5 is 188. Almost all the babies are increased in birth weight.

After a long time the probability of <3kgs is permissible in to the same state is 0.0028, the probability is moving to 3-4 kgs is 0.0592, the probability is moving to 4-5 kgs is 0.2622, the probability is moving to >5 is 0.6758.

The expected frequencies of the class defined in the frequency distribution are calculated.

H_0: No significant difference between the expected and observed frequencies for birth weight of babies (Table 4).

Table 3: Birth weight of the babies (at the end of one year)

Birth weight (kgs)	*<3*	*3-4*	*4-5*	*>5*
<3	4	12	32	27
3-4	2	7	106	122
4-5	1	12	16	95
>5	0	3	19	42

$$P^2 = \begin{bmatrix} .0076 & .0714 & .2562 & .6648 \\ .0043 & ..0697 & .2273 & .6987 \\ .0023 & .0526 & .2909 & .6542 \\ .0028 & .0609 & .2541 & .6822 \end{bmatrix}$$

P^n = (0.0028, 0.0592, 0.2622, 0.6758)

Table 4: Comparison of expected and actual distribution

Birth weight (kgs)	*Observed frequency*	*Expected frequency*
<3	7	1.4
3-4	34	29.6
4-5	173	131.1
>5	286	337.9

A χ^2 test of goodness of fit with 3 degree of freedom when

$$\chi^2 = \sum_{I=1}^{4} \frac{(O-E)^2}{E} = 44.415$$

The tabulated at 5% level of significance with 3 degree of freedom is 7.815. The null hypothesis is not accepted. Therefore there is significance difference between the expected and observed frequencies for birth weight of babies.

Model of Birth Weight – I and II

From the table 5 the highest frequency of the birth weight is the state 3-4 to >5 is 359. Almost all the babies are increased in birth weight.

After a long time the probability of <3kgs is permissible into the same state is 0.0028, the probability is moving to 3-4 kgs is 0.0722, the probability is moving to 4-5 kgs is 0.2620, the probability is moving to >5 is 0.6630.

H_0: No significant difference between the expected and observed frequencies for birth weight of babies (Table 6).

Table 5: Birth weight of the babies (at the end of one year)

Birth weight (kgs)	*<3*	*3-4*	*4-5*	*>5*
<3	6	19	47	39
3-4	5	17	187	296
4-5	2	22	30	220
>5	0	8	34	68

$$P = \begin{bmatrix} .0541 & .1712 & .4234 & .3513 \\ .0099 & .0337 & .3703 & .5861 \\ .0073 & .0804 & .1094 & .8029 \\ 0 & .0727 & .3091 & .6182 \end{bmatrix}$$

$$P^2 = \begin{bmatrix} .0077 & .0746 & .2412 & .6765 \\ .0035 & .0752 & .2383 & .6830 \\ .0019 & .0712 & .2930 & .6339 \\ .0029 & .0722 & 2519 & .6730 \end{bmatrix}$$

P^n = (0.0028, 0.0722, 0.2620, 0.6630)

Table 6: Comparison of expected and actual distribution

Birth weight (Kgs)	*Observed frequency*	*Expected frequency*
<3	13	2.8
3-4	66	72.2
4-5	298	262
>5	623	663

A χ^2 test of goodness of fit with 3 degree of freedom when

$$\chi^2 = \sum_{I=1}^{4} \frac{(O-E)^2}{E} == 44.55$$

The tabulated at 5% level of significance with 3 degree of freedom is 7.815. The null hypothesis is not accepted. Therefore there is significance difference between the expected and observed frequencies for birth weight of babies.

DISCUSSION

From the above results reveals that at the time of baby birth weight is <3kgs after one year duration the weight increases >5kgs. About 40% of 10.5 million childhood death in the world occurs in Southeast Asian region including India. Nearly 70% of the childhood deaths are due to acute respiratory, infection, diarrhea, measles and malnutrition. So limited resources are available for health care are consumed by very large number of people for these common childhood illness everyday. This is one of the major reasons for children with low birth weight remaining in the same state or coming back to the same state. This paper deals with data pertaining to only two urban populations, the problem may be more acute in rural area.

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