



JOINT AND NET EFFECT ON LIFE EXPECTANCY AT BIRTH THROUGH THE LITERACY RATE AND INFANT MORTALITY RATE OF INDIA AND STATE-WISE_BY PATH ANALYSIS

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ABSTRACT

The main focus of this paper is to draw the interaction and direct effects on longevity at birth through the Vital indicators of India and its States. Observed that few demographic and Socio-economic factors which have been influencing growth of the country. This research paper is mainly designed to bring readers attention on demographic and economic status of India as well as Kerala compared to other Indian states. Through this paper author put an attempt to on contribution or impact of demographic and socio-economic factors on growth rate of India. The information about Vital Statistics has been collected from the sources of Government Offices and previous research articles of Economic Reviews. Conclusion have beendrawn the rate of demographic indicators of Kerala has been drastically increased. Although it has been better in social, economic, cultural and Health factors; thus, well-being of Kerala as compared to other developing and developed countries also. Employed descriptive methods, multiple correlations, Regression and Fitted Trend lines; Utilised R software for the Statistical analysis.

Keywords: demography, India, Kerala, path analysis.

INTRODUCTION

The percentage of population in agriculture is the most highly correlated variables with life expectancy, followed by literacy and safe water. Literacy and percentage of population are showing more variance in life expectancy. To increase longevity, more emphasis should be placed upon education, since the literacy of female and male may eliminate more factors associated with malnutrition also [Rogers RG, 1989].

In India, Kerala is the one of the smallest states; and it has remarkable reasons. It has harmonious relations between the different communities like Hindu, Muslims and Christians. The women have high level of social status and high level of education traditionally. The women empowerment played an important role for the development of Kerala. It has high literacy rate, less fertility rates and low child mortality rates. The awareness among women was created by family planning campaigns which made to control the population of Kerala [Economic Review, 1996].

Since Kerala has high status in women empowerment, literacy and social development as compared to women in other states of India. An attempt to understand the trends in fertility rate and literacy of women have a strong negative association. Kerala has drawn considerable attention in recent years for its paradoxical pattern of growth with high social development indicators on a weak economic base, often referred to as the Kerala model of development. The concept of autonomy and empowerment in terms of power of decision making; the measure of economic autonomy in terms of women's access and control over house hold

income, women in Gujrat had higher level than in Kerala despite lower level of literacy [Mridul Eapen, 2002].

The effect of Socio-economic inequality on health and longevity reflects a combination of negative exposure and lack of resources by individuals. In Kerala, for the past many decades policies in terms of health care and social reforms are well known. Despite the overall progress in health and longevity in a low-resource region like the state of Kerala, India, socio-economic disparities in health are prominently observed at the population [Catherine, 2011].

The Demography and Economic status play vital role for the development and control the population of a country or state or region. An important source for the Demographic data is Registration of Births and Deaths. In India, the Registration of Births and Deaths were started at the beginning in a voluntary basis. The (CRS) Civil Registration was introduced in India under the Registration of Births and Deaths Act (RBD Act), 1969. CRS has been initiating to record the vital events such as Births, Deaths and marriages occurring in a population. The Government of India Gazette notification of dated 21st March 1970, introduced for Kerala and many other states to publish Registration of Births and Deaths [Vital Statistics Division, 2014].

Over the past forty years, the Poverty has been observed declining 12% out of 59.74% in Kerala 2011-2012. In India the Poverty rate was recorded 54.88% in 1973-1974, it was reduced to 29.5% in 2011-2012. The extensive improvement in reducing the incidence of both urban and rural Poverty. There were many factors played vital role to reduce the Poverty such as Health care, Decentralisation, Pension Schemes, Kudumbashree, Land



reforms and spread of Education. [Economic Review, 2017].

MATERIAL

The statistical information has been collected from previous published journals and articles of Government office of Kerala and India. Economic Reviews, Vital Reports of Statistics, Demography year books of Kerala and latest Budget Analysis. The collected data had been analysed for only few factors of Kerala and compared with India and Indian states. The main focus of the comparison is to trace the factors more effected for the development of country.

METHODS

Statistical methods have been utilized in the study are; Computed multiple correlation and Regression procedures for the Path Analysis techniques and also calculated required tests of significance. The following Tble-1, displayed about few demographic variables of vital events of 15 major states of India. Traced the best set of indicators related to Life expectancy at birth. SPSS programmed procedures utilized to find the multiple correlations and Path coefficients. For the analysis state-wise comparison, Bar charts have been utilised, it has been developed by using R-Language software.

Principles of Path Analysis:

The technique of Path analysis which was developed during 1930s by Sewall Wright as an aid to the quantitative development of genetics gained popularity in social science studies with the further expositions made by Duncan and multiple regression analysis. It applies only to sets of relationships among the variables which are linear, additive and causal. In multiple regressions, each predictor variable has a direct effect on the response variable. However, variables may also affect the response variable through one or more intervening variables. Path analysis is a technique for analysing such causal relationships.

RESULT AND DISCUSSIONS

The following charts have been observed, individual and 15 major State-wise comparison:

R-coding:

Max.india<-c(72.99,26.5,67.91,44,7.1,54.1)

max.

literacy<-
c(67.02,72.19,61.8,78.03,75.55,75.36,94,69.32,82.34,72.8
7,75.84,66.11,80.09,67.68,76.26,72.99)

> max. literacy

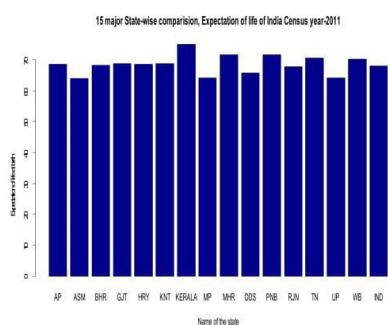
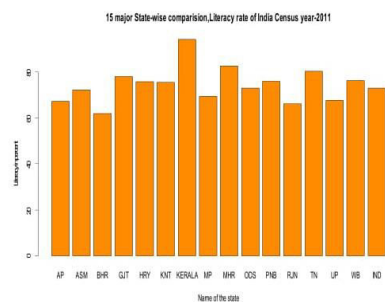
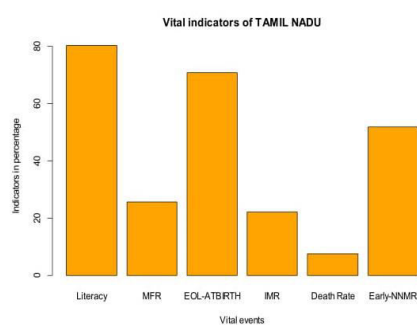
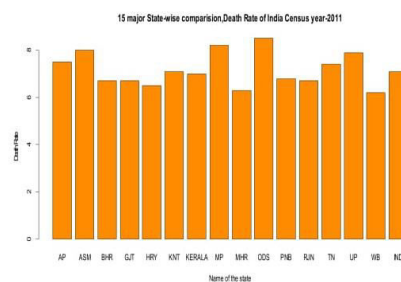
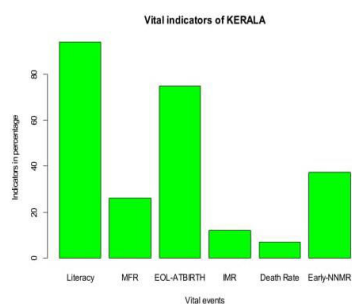
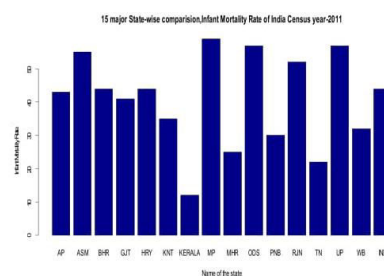
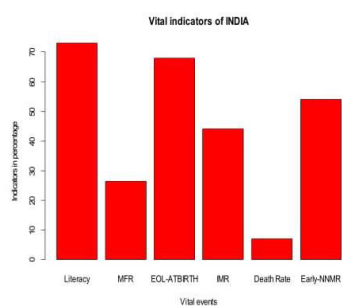
barplot(max.literacy, main="15 major State-wise
comparison,Literacy rate of India Census year-2011",
xlab="Name of the state", ylab="Literacy in percent",
names.arg=c("AP","ASM","BHR","GJT","HRY","KNT",
"KERALA","MP",
"MHR", "ODS", "PNB","RIN","TN","UP","WB","IND"),
col="dark orange")

In Andhra Pradesh the literacy rate and Infant Mortality Rate have been observed 67.02 and 43 respectively. Kerala has literacy (94.00) and IMR (12) observed. It has very high literacy rate and low IMR as compared to Andhra Pradesh, Tamil Nadu, Bihar and Other States of India. The charts have been displayed below for the indicators of different States of India.

In Table-1 has the following description; Lit. = Literacy; M-A-F = Mean-Age-Fertility; EOL- at birth = Expectation of life at birth; IMR = Infant Mortality Rate; D.R = Death Rate; ENN-MR = Early Neo-Natal Mortality Rate.

The Resultant Table-1, shown correlation analysis between the indicators. The high and negative association observed with Y_1 and X_4 ; high and positive association observed with Y_1 and X_2 . The R^2 value observed from Result Table-2, Model summary is ($R^2 = 0.907$). The description of the variables is Y_1 = Life expectancy at birth; X_2 = Literacy rate; X_3 = Mean-age Fertility; X_4 = Infant Mortality Rate. The Analysis of Variance from Resultant Table-3 has shown the Regression is significant value (0.000). The Infant Mortality Rate (X_4) is significant (0.000) shown in Resultant Table-4.

$Y_1 = P_{12}X_2 + P_{13}X_3 + P_{14}X_4$; the model has P_{12} , P_{13} , P_{14} are the path coefficients values has been taken from the Resultant Table-4. Standardized coefficients (Beta) values -0.049, 0.000 and -0.990 respectively. $R^2_{1.234} = 0.907$ is the coefficient of determination value which has taken from the model summary Result Table-2. R_u , is the residual value. The resultant Table: Component Analysis of coefficient of determination, $R^2_{1.234}$ has been followed by Net effect + Joint effect = Total Effect.



**Table-1.** 15 major State-wise Socio-Economic indicators of India (as per Census 2011).

Name of the states	Lit.	M-A-F	EOL at birth	IMR	D.R	ENN-MR
Andhra Pradesh	67.02	24.3	68.46	43	7.5	56.5
Assam	72.19	27.0	63.92	55	8.0	45.4
Bihar	61.80	27.8	68.09	44	6.7	56.3
Gujarat	78.03	26.4	68.69	41	6.7	53.9
Haryana	75.55	25.7	68.60	44	6.5	53.1
Karnataka	75.36	24.7	68.83	35	7.1	57.9
Kerala	94.00	26.2	74.94	12	7.0	37.3
Madhya Pradesh	69.32	26.2	64.16	59	8.2	53.4
Maharashtra	82.34	25.0	71.64	25	6.3	60.1
Odisha	72.87	26.6	65.83	57	8.5	53.7
Punjab	75.84	26.2	71.60	30	6.8	58.9
Rajasthan	66.11	26.7	67.72	52	6.7	55.3
Tamil Nadu	80.09	25.6	70.61	22	7.4	51.7
Uttar Pradesh	67.68	27.9	64.14	57	7.9	52.2
West Bengal	76.26	24.7	70.16	32	6.2	56.7
India	72.99	26.5	67.91	44	7.1	54.1

[Source: Census of India, 2011].

Lit. = Literacy; M-A-F = Mean-Age-Fertility; EOL- at birth = Expectation of life at birth;

IMR = Infant Mortality Rate; D.R = Death Rate; ENN-MR = Early Neo-Natal Mortality Rate.

Table-2. Correlation analysis.

	Y ₁	X ₂	X ₃	X ₄
Y ₁	1	0.732	-0.451	-0.952
X ₂		1	-0.35	-0.788
X ₃			1	0.473
X ₄				1

Table-3. Model summary.

Model	R	R Square	Adjusted R square	Std. Error of the Estimate
	0.953 ^a	0.907	0.884	1.02164
a. Predictors: (Constant), X ₄ , X ₃ , X ₂				

Table-4. ANOVA table (Dependent variable: Y₁).

Model	Sum of squares	Degrees of freedom	Mean square	F-Statistic	Sig.
1 Regression	122.827	3	40.942	39.226	0.000
Residual	12.525	12	1.044		
Total	135.352	15			

**Table-5.** Coefficients.

Model		Unstandardized coefficients		Standardized coefficients	t-statistic	Sig.
		B	Std. Error	Beta		
1	(Constant)	78.641	8.587		9.158	0.000
	X2	-0.019	0.057	-0.049	-0.341	0.739
	X3	0.000	0.285	0.000	-0.001	1.000
	X4	-0.215	0.033	-0.990	-6.525	0.000
a. Dependent Variable: Y1						

The statistical model adopted for this is a simple linear model as given:

$$Y1 = P_{12}X_2 + P_{13}X_3 + P_{14}X_4$$

$$R^2_{1,234} = 0.907; \quad P_{12} = -0.049; \quad P_{13} = 0.000; \quad P_{14} = -0.990$$

$$R_u = \sqrt{1 - R^2_{1,234}} = 0.304$$

$$R^2 = P^2_{12} + P^2_{13} + P^2_{14} + 2P_{12}P_{13}r_{23} + 2P_{12}P_{14}r_{24} + 2P_{13}P_{14}r_{34}$$

Table-6. Component Analysis of Coefficient of determination, $R^2_{1,234}$.

Details	Component	Amount	R^2 (%)	Percentage of R^2
Net effect				
Due to X2	P^2_{12}	0.0024	0.24	-3.370
Due to X2	P^2_{13}	0.0000	0.00	0.000
Due to X2	P^2_{14}	0.0024	0.24	-3.370
Total Net effects		0.0048	0.48	-6.741
Joint effect				
Due to X_2X_3	$2P_{12}P_{13}r_{23}$	0.000	0.00	0.000
Due to X_2X_4	$2P_{12}P_{14}r_{24}$	-0.076	-7.60	106.741
Due to X_3X_4	$2P_{13}P_{14}r_{34}$	0.000	0.00	0.000
Total of Joint effects		-0.076	-7.60	100.000
Total multiple				
Determination	$R^2_{1,234}$	-0.0712	-7.12	

CONCLUSIONS

Among the Indian states comparison of results, Kerala has been found better in socio-economic and demographic variables. This can be concluded that out of four vital indicators; the best set of factors traced by Path analysis (Literacy and Infant mortality), which are having high percentage $R^2 = 106.741$. Joint effect X_2X_4 versus Life expectancy at birth of India by state-wise. These indicators are showing better in Kerala and depicting positive trend as compared to other states of India. Literacy is one of the major indicators has shown high for female and male in Kerala. Infant mortality rate of Kerala has also been declined trend as compared to other states of India. Although, there are some of the deficiency factors affecting but Kerala has been stepping ahead compared to Indian states and it is also competitive internationally by demographic indicators. Development of a country or state or region or area is more effected by demographic indicators. To maintain constant development of the state,

Government has to take initiative steps to overcome the deficiency of other factors like Un-employment.

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