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Statistical Modeling – Analysis of Health, Education, Agricultural Data

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Abstract: For analysis of health, education and agriculture data of India, some statistical models are adopted. Chow test and dummy variable methods are applied for testing the structural change.
Key words: Linear regression, Chow test, Dummy variable approach.

I. INTRODUCTION

The purpose of this paper is to construct statistical modeling in health, education and agriculture and to analyze the related data. The specific aims of the present study are (i) to estimate statistical model assuming linear relationship between total population (pop) as dependent variable and number of births (bir), number of deaths(dea), number of hospitals(hos), number of allopathic doctors(ado) as independent variables and to test the significant effect of independent variables for the data relating to India during the period 2000-2015.Also using the same model to test the structural change in total population between the two periods 2000-2007 and 2008-2015; (ii) to estimate the statistical model assuming linear relationship between no. of medically certified deaths (mcd) as dependent variable and number of deaths due different causes like diabetic mellitus (mel), malaria (mal), pneumonia(pne), tuberculosis(tub) as four independent variables and to test the significant effect of independent variables for India during the period 2000-2015.Also using the same model to test the structural change in mcd between the two periods 2000-2007 and 2008-2015; (iii) to estimate statistical model assuming linear relationship between enrolment in education including higher & secondary (ee) as dependent variable and no. of institutions(ins), no. of teachers (tea), per capita income(pci) as independent variables and to test the significant effect of independent variables for the data relating to India during the period 2000-2015.Also using the same model to test the structural change in enrolment in education between the two periods 2000-2007 and 2008-2015; (iv) considering the same linear statistical model as above to test the structural change between enrolment in higher education and enrolment in secondary education during the period 2000-2015.(v) considering a linear statistical model assuming production of food grains (pfg) as dependent variable and total population (pop), cropped area (cra), per capita income(pci) as independent variables and to test their significance for the data of India, Andhra Pradesh, Tamil Nadu, Kerala and Karnataka during the period 2000-2015, also to test the structural change in production of food grains between the two periods 2000-2007 and 2008-2015; (vi) Assuming the same model to test the structural change in production of food grains among the four states Andhra Pradesh, Tamil Nadu, Kerala and Karnataka during the period 2000-2015.

II. REVIEW OF LITERATURE

Spatial and temporal variation of mortality and deprivation through statistical modeling was studied by M.L. Senior et.al (1998). Statistical models for mobile population was discussed by Ma Yong Li (1998). Statistical model for population reconstruction using Age-at-Harvest data is studied by Nancy. E. Gove et.al (2002). Statistical modeling of seasonal and environmental influences on the population dynamics of fish community was discussed by J. Maes et.al (2004). Biometrical methods for evaluating phenotypic stability in plant breeding was explained by Ferreira. D.F et.al (2006). Statistical model for human fecund ability was explained by Haibo Zhou (2006). Use of dummy variables for investigating structural stability in fertilizer- yield response models is studied by Suman Kumar et.al(2008).

Statistical modeling for wheat crop production was developed by Rajarathinam Arunachalam and Vinoth Balakrishnan (2012). Statistical model for analyzing wheat yield was studied Lucie Michel et.al (2013). Statistical models for identifying climate contributions to crop yields was discussed by SHI Wenjiao et.al (2013). Education and economic growth: A meta-regression analysis was explained by Nikos Benos and Stefania Zotou(2014). Statistical modeling of key variables in social survey data analysis was discussed by Roxanne Connelly et.al (2016).

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III. METHODOLOGY

In this section, we will present general linear regression model its OLS estimation and test for the significance of parameters. Also we present the procedures for testing the structural change given by G.C. Chow (1960) and Damodara Gujarati(1970).

A. General Linear Model

Let us consider the model

$$Y_{n\times 1} = X_{n\times k}\,\beta_{k\times 1} + \epsilon_{n\times 1} \qquad (1)$$

where Y_{nx1}: (nx1) vector of dependent variable; X_{nxk} : (nxk) data matrix

β_{kx1}: (kx1) vector of the parameters; ε_{nx1} : (nx1) vector of error variable

with the following assumptions

1) Y is a linear combination of independent variables $X_1, X_2, \ldots, X_k$ and disturbance vector ϵ.
2) $E(\epsilon) = 0$
3) $E(\epsilon\,\epsilon') = \sigma^2 I_n$
4) $\rho(X) = k$
5) The observations of the independent variables must be fixed known coefficients.
6) $\epsilon \sim N(0, \sigma^2 I_n)$

The model (1) with above assumptions is known as general linear model.

We know that OLS estimator of the vector β is $\hat{\beta} = (X'X)^{-1}X'Y$ (2)

$E(\hat{\beta}) = \beta$ and $V(\hat{\beta}) = \sigma^2 (X'X)^{-1}$ (3)

For testing $Ho:\ \hat{\beta}_i = 0$, $t_i = \hat{\beta}_i / S.E.(\hat{\beta}_i) \sim t_{n-k}$, i = 1, 2, ….k (4)

i.e $t_i = \hat{\beta}_i / \hat{\sigma}\sqrt{a_{ii}}$, a_{ii} is the $(i,i)^{th}$ element of $(X'X)^{-1}$

if t calculated values is less than t critical value accept H_0, otherwise reject H_0.

For testing the complete regression $Ho:\ \hat{\beta}_1 = \hat{\beta}_2 = \cdots = \hat{\beta}_k = 0$, we use the following analysis of variance table.

Table (1)

Source of variation	D.f	Sum of Squares	Mean Sum of Square	F cal	F cri
Due to Regression	k-1	$\hat{\beta}'X'Y$	$\frac{\hat{\beta}'X'Y}{k-1}$	$\frac{\hat{\beta}'X'Y/(k-1)}{\hat{\sigma}^2}$	$F_{(k-1),(n-k)}$
Error	n-k	$Y'Y - \hat{\beta}'X'Y = e'e$	$\frac{e'e}{n-k} = \hat{\sigma}^2$	-	-
Total	n-1	$Y'Y$	-	-	-

If F cal < F cri, accept H_0, otherwise reject H_0 at required level of significance

B. Test for Structural Change

A structural change is an economic condition that occurs when an industry or market changes how it functions or operates. A structural change will shift the parameters of an entity, which can be represented by significant changes in time series data. Test for structural change is due to G.C. Chow and D. Gujarati.

C. Chow Test

Chow test is a multi stage procedure to test the structural change among different sets of observations involving different number of independent variables in the opted model.

Consider a linear model with two independent variables to test the structural change between two sets of observations

Let the opted model be $Y_i = \alpha_0 + \alpha_1 X_{1i} + \alpha_2 X_{2i} + \varepsilon_i$, $i = 1, 2, \ldots, n$ (5)

Let $Y_{1j_1} = \alpha_{01} + \alpha_{11} X_{1j_1} + \alpha_{21} X_{2j_1} + \varepsilon_{1j_1}$, $j_1 = 1, 2, \ldots, n_1$ (6)

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and $Y_{2j_1} = \alpha_{02} + \alpha_{12}X_{1j_2} + \alpha_{22}X_{2j_2} + \varepsilon_{2j_2}$, $j_1 = 1, 2, \ldots, n_2$ (7)

are the corresponding models fitted to the first and second sets of data with n_1 and n_2 observations respectively.

From (6) and (7) we can think of the following possibilities regarding the coefficients.

$\alpha_{01} = \alpha_{02}; \alpha_{11} = \alpha_{12}; \alpha_{21} = \alpha_{22}$; (ii) $\alpha_{01} \neq \alpha_{02}; \alpha_{11} = \alpha_{12}; \alpha_{21} = \alpha_{22}$

$\alpha_{01} = \alpha_{02}; \alpha_{11} \neq \alpha_{12}; \alpha_{21} = \alpha_{22}$; (iv) $\alpha_{01} \neq \alpha_{02}; \alpha_{11} \neq \alpha_{12}; \alpha_{21} \neq \alpha_{22}$

In the similar fashion we may have different possibilities. To test whether the two regressions are different or not, we can construct the Chow test as follows:

Combine the two sets of observations (n_1+n_2), fit the combined regression equation (5) and obtain the corresponding residual sum osquares S_1 with (n_1+n_2-k) degrees of freedom, k is the number of parameters involved in the model.

Run the regressions (6) and (7) independently, obtain the respective residual sum of squares S_2 and S_3 with degrees of freedom (n_1-k) and (n_2-k) respectively and compute $S_4 = S_2 + S_3$ with degrees of freedom (n_1+n_2 -2k)

Obtain $S_5 = S_1 - S_4$ with degrees of freedom k.

$$F = \frac{S_5/k}{S_4/(n_1+n_2-2k)} \sim F_{(k, n_1+n_2-2k)} \qquad (8)$$

If F-cal > F-cri, reject the hypothesis that the parameters are same for two sets of observations, otherwise accept the hypothesis at required level of significance. This procedure may be extended to the model with any number of independent variables and any number of sets of observations.

D. Gujarati's Dummy Variable Approach

Damodara Gujarati [1970a, 1970b] described the use of dummy variables as an alternative to Chow test for testing the equality between sets of coefficients in linear regression. For testing the structural change or shift between different periods or different regions we may apply the above test. Chow test is general in nature, it merely tells whether the regression are different or not without specifying whether the differences if any is due to difference in intercept terms or due to difference in coefficient of particular explanatory variable. But through Gujarati's dummy variable approach, if the regressions are different, it tells us in which way they are different.

The two equations (6) and (7) are clubbed by introducing one dummy variable D as in equation (9) and estimated through OLS method.

$Y_i = a_0 + a_1D + a_2X_{1i} + a_3DX_{1i} + a_4X_{2i} + a_5DX_{2i} + \varepsilon_i$, i =1, 2, 3, ….. (n_1+n_2) (9)

where,

D = 1, if the observation belongs to set-2
= 0, other wise

a_0 : intercept for set-1

a_1 : differential intercept for set-2

a_2, a_4 : slope co-efficient of Y with respect to X_1 and X_2 respectively for set-1

a_3, a_5 : differential slope co-efficient of Y with respect to X_1 and X_2 respectively for set-2

Y : dependent variable; X_1, X_2 are two independent variable.

The actual values of intercept and slope coefficients for two sets are obtained as follows:

For set-1: $Y_1 = a_0 + a_2 x_1 + a_4 x_2$ (10)

For set-2: $Y_2 = (a_0+a_1) + (a_2+a_3) x_1 + (a_4+a_5) x_2$ (11)

Depending up on the statistical significance of estimated differential intercepts and differential slope coefficients one can find out whether the sets of linear regression coefficients are different or not. If p-value is less than 0.05 we reject H_0 at 5% los and conclude that the corresponding coefficient is significant. This procedure may be extended to any number of independent variables and any number of sets of observations. Note that the number of dummy variables used in the model are one less than the number of sets of observations.

IV. VARIABLES UNDER STUDY

Total population in lakhs	: pop
Number of births	: bir

Number of deaths	: dea
Number of hospitals	: hos
Number of allopathic doctors	: ado
Number of medically certified deaths	: mcd
Number of deaths due to diabetic mellitus	: mel
Number of deaths due to malaria	: mal
Number of deaths due to pneumonia	: pne
Number of deaths due to tuberculosis	: tub
Enrolment in education (higher and secondary) in millions	: ee
Number of institutions (higher and secondary)	: ins
Number of teachers (higher and secondary)in thousand	: tea
Per capita income	: pci
Production of food grains in '000 Tonnes	: pfg
Cropped area in'000 hectares	: cra

The relevant data is extracted from Directorate of Economics and Statistics, Department of Agriculture, Cooperation and Farmers Welfare, Central Statistics Office, Annual Reports on the Registration of Births and Vital Statistics of India Based on the Civil Registration System, Reports on Medically Certified Causes of Deaths in India, National Health Profile, Sample Registration System Bulletin, Selected Educational Statistics Reports, Statistical Year Books In India.

V. EMPIRICAL ANALYSIS

Regression models for total population, medically certified deaths and enrolment in education are fitted to the data of 2000-2015 relating to India also chow test, dummy variable approach are applied for structural change between 2000-2007 & 2008-2015. Structural change is tested between enrolment in higher & secondary education during 2000-2015. Regression model for production of food grains in India, Andhra Pradesh, Tamil Nadu, Kerala and Karnataka is fitted to the data of 2000- 2015, and for the same structural change is tested between 2000-2007 & 2008-2015. Also tested for structural change in production of food grains among the four states during 2000-2015.

A. For Total Population During the Period 2000 – 2015in India:

pop =7103.6796+0.0001bir +0.0001dea – 0.0049 hos + 0.0034 ado ; $R^2 = 0.9804$ (12)

(0.0000) (0.2385) (0.8015) (0.5401) (0.0192)

Figures in parant has is indicates p-values.

B. For structural change in total population between 2000-2007 and 2008-2015:

1) Chow Test

S_1= 220218.8908, S_2= 36880.1063, S_3= 7299.4126

S_4= 44179.5189, S_5= 176039.3719, F = 4.78156

Since F(5,6) at 5% los = 4.3874, we reject H_0 and conclude that there is structural change in the two periods 2000-2007 and 2008-2015.

2) Dummy Variable Approach

Table (2)

Variables	Coefficients	Standard Error	t Stat	P-value
Intercept	7908.4030	848.3687	9.3219	0.0001
D	-2685.2696	1550.6008	-1.7318	0.1340
Bir	0.0003	0.0001	2.8942	0.0275
Dbir	-0.0002	0.0001	-1.1202	0.3054

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dea	-0.0005	0.0003	-1.7450	0.1316
Ddea	0.0010	0.0004	2.4915	0.0471
hos	-0.0222	0.0096	-2.3168	0.0597
Dhos	0.0332	0.0137	2.4209	0.0518
ado	0.0021	0.0027	0.8036	0.4523
Dado	-0.0006	0.0029	-0.2007	0.8475

From Chow test, we conclude that there is structural change in the total population between the two periods 2000-2007 and 2008-2015. From dummy variable approach since differential coefficient of number of deaths is significant we conclude the there is structural change in the total population during the period 2008-2015 with respect to the variable number of deaths.

3) *For Medically Certified Deaths During 2000-2015 in India:* mcd = 487426.2508 + 19.2802mel-138.5200 mal - 32.4097 pne + 0.7707 tub ; R = 0.9857 (13)
(0.0006) (0.0000) (0.0004) (0.1703) (0.4438

4) *For structural between 2000-2007 and 2008-2015:*

S_1= 9767028926.2709, S_2=4122153706.0143, S_3= 2787847155.9416
S_4= 6910000861.9559, S_5= 2857028064.3150, F = 0.4962

Since F(5,6) at 5% = 4.3874, we accept H_0 and conclude that there is no structural change in the two periods 2000-2007 and 2008-2015.

5) *Dummy Variable Approach*

Table (3)

variables	Coefficients	Standard Error	t Stat	P-value
Intercept	367073.2850	257576.1796	1.4251	0.2040
D	-402888.1008	1367341.3385	-0.2947	0.7782
mel	14.6021	9.3968	1.5539	0.1712
D mel	2.9783	10.4453	0.2851	0.7851
mal	-40.2435	83.6821	-0.4809	0.6476
Dmal	-149.6575	129.9199	-1.1519	0.2932
Pne	-8.5150	56.9652	-0.1495	0.8861
Dpne	-34.2323	66.2271	-0.5169	0.6237
Tub	1.0646	2.1764	0.4891	0.6421
Dtub	9.9350	21.6815	0.4582	0.6629

From Chow test and dummy variable approach it is observed that there is no structural change in the mcd between 2000-2007 and 2008-2015

C. *For Enrolment in Education (Including both Higher and Secondary) During the Period 2000-2015 in India:*

ee = 68.0686 + 0.0002 ins - 0.0048 tea+ 0.0004 pci ; R^2 = 0.9820 (14)
(0.0032) (0.0000) (0.1270) (0.0631)

1) For structural in enrolment in education between two period 2000-2007 & 2008-2015:

a) Chow test

S_1= 325.0932, S_2= 27.6124, S_3= 58.3220
S_4= 85.9344, S_5= 239.1588, F = 5.5661

Since F(4,8) at 5% = 3.838, we reject H_0 and conclude that there is structural change in the two periods.

2) Dummy variable approach:

Table (4)

variables	Coefficients	Standard Error	t Stat	P-value
Intercept	-14.4545	35.8824	-0.4028	0.6976
D	249.6920	57.8822	4.3138	0.0026
ins	0.0001	0.0001	1.5049	0.1708
Dins	-0.0001	0.0001	-1.1984	0.2651
tea	0.0260	0.0115	2.2734	0.0526
Dtea	-0.0277	0.0117	-2.3663	0.0455
pci	-0.0010	0.0012	-0.8098	0.4415
Dpci	0.0019	0.0012	1.5319	0.1641

Since differential intercept and differential coefficient of teachers are significant we conclude that there is structural change in enrolment in education during period 2008-2015 with respect to the intercept and no. of teachers.

D. For Structural Change Between Enrolment in Higher Education and Enrolment in Secondary Education During the Period 2000-2015 in India:

1) Chow Test

S_1= 1631.5511, S_2= 9.5985, S_3= 295.6936
S_4= 305.2921, S_5= 1326.2590, F = 26.0654

Since F(4,24) at 5% = 1.63, we reject H_0 and conclude that there is structural change in enrolment in higher education and secondary education during the period 2000-2015.

2) Dummy Variable Approach

Table(5)

variables	Coefficients	Standard Error	t Stat	P-value
Intercept	5.2412	6.4929	0.8072	0.4275
D	65.5977	13.9718	4.6950	0.0001
ins	0.0003	0.0003	1.0082	0.3234
Dins	-0.0002	0.0003	-0.5579	0.5821
tea	-0.0083	0.0309	-0.2698	0.7896
Dtea	0.0042	0.0309	0.1347	0.8940
pci	0.0003	0.0005	0.5420	0.5928
Dpci	-0.0001	0.0005	-0.2620	0.7956

It is observed that since differential intercept is significant we conclude that there is structural change in the intercept term in secondary education.

E. For Production of Food Grains During 2000-2015 in

1) India

pfg = -161959.4086 -3.8468 pop + 2.1072 cra + 0.7014 pci ; R^2= 0.9103 (15)
(0.1331)(0.6092) (0.0015) (0.0174)

2) Andhra Pradesh

pfg = -1314.0219 - 22.5631 pop + 2.6288 cra + 0.0245 pci ; R^2 =0.5702 (16)
(0.8243) (0.2220 (0.0245) (0.4136)

3) Tamil Nadu

pfg = -26555.2347 + 15.8286 pop + 3.9169 cra + 0.0070 pci ; R^2= 0.8092 (17)

(0.1384) (0.5013) (0.0001) (0.8016)

4) Kerala

pfg = 1795.0261 – 4.9136 pop + 0.1713 cra – 0.0003 pci ; R^2= 0.7729 (18)

(0.1688) (0.0597) (0.3879) (0.6904)

5) Karnataka

pfg= 4301.8608 – 65.1508 pop + 3.01685 cra +0.1192 pci ; R^2= 0.8749 (19)

(0.7313) (0.0215) (0.0000) (0.0032)

6) For structural change between 2000-2007 & 2008-2015:

a) India

S_1= 893454221.7245, S_2=298144453.7190, S_3=398256833.0742

S_4=696401286.7931, S_5=197052934.9314, F = 0.5659

b) Andhra Pradesh

S_1=77372150.1086, S_2=1683826.7391, S_3=34562188.6570

S_4= 36246015.3961, S_5= 41126134.7125, F = 2.2693

c) Tamil Nadu

S_1=8412870.8230, S_2=4213834.2370, S_3= 3813505.9943

S_4=8027340.2313, S_5=385530.5917, F = 0.0961

d) Kerala

S_1= 26479.7616, S_2= 6462.856857, S_3=8182.527658

S_4= 14645.3845, S_5= 11834.3771, F = 1.6161

e) Karnataka

S_1= 8281577.807,S_2= 3482960.287, S_3= 2572120.011

S_4= 6055080.2980, S_5= 2226497.5092, F =0.7354

In all the above since F(4,8) at 5%=3.838, we accept H_0 and conclude that there is no structural change in the two periods.

7) Dummy Variable Approach

	India: Table(6)		Andhra Pradesh: Table (7)		Tamil Nadu : Table (8)		Kerala: Table (9)		Karnataka: Table(10)	
Variables	Coefficients	P-value	Coefficients	P-value	Coefficients	P-value	Coefficients	P-value	Coefficients	P-value
Intercept	-208459.4442	0.3882	-5118.72454	0.9790	-24661.4128	0.5906	3792.7581	0.2880	-13731.2077	0.6251
D	211867.3361	0.7854	21507.0482	0.9122	-2963.5531	0.9538	-4724.2077	0.2658	57835.4049	0.3396
pop	1.5819	0.9337	-26.3722	0.9171	12.4678	0.8345	-15.5535	0.0472	-45.0333	0.3246
Dpop	-21.0167	0.7566	-15.7136	0.9508	3.6201	0.9582	17.7312	0.0576	-70.7850	0.5430
cra	2.1740	0.0145	2.7042	0.1776	3.8747	0.0461	0.5922	0.4250	3.8886	0.0019
Dcra	0.0460	0.9745	0.4240	0.8597	0.2941	0.8952	-0.3143	0.7188	-1.6335	0.2492
pci	-0.6260	0.7781	0.2734	0.7991	0.0239	0.7932	0.0084	0.1642	0.0387	0.7970
Dpci	1.4944	0.5686	-0.3828	0.7225	-0.0228	0.8242	-0.0083	0.1714	0.1189	0.5444

From table (6) – table (10) none of the differential intercepts and differential slope coefficients are significant, we conclude that there is no structural change in production of food grains in India, Andhra Pradesh, Tamil Nadu, Kerala and Karnataka.

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F. For Structural Change in Production of Food Grains Among Four Southern States of India During 2000-2015:

1) Chow Test

S_1= 193836765.2955, S_2=77372150.1086, S_3= 8412870.823, S_4=26479.7616
S_5= 8281577.807, S_6=94093078.5005, S_7=99743686.7950, F= 0.2358

Since F(12,48) at 5%= 1.74 we accept H_0 and conclude that there is no structural change in the production of food grains among the four southern states of India during 2000-2015.

2) Dummy Variable Approach

Table (11)

	Coefficients	Standard Error	t Stat	P-value
Intercept	-1314.0219	3193.1555	-0.4115	0.6825
D_1	-25241.2128	28155.2990	-0.8965	0.3745
D_2	3109.0480	36675.7016	0.0848	0.9328
D_3	5615.8826	20869.3464	0.2691	0.7890
pop	-22.5631	9.6578	-2.3363	0.0237
D_1pop	38.3917	39.3745	0.9750	0.3344
D_2pop	17.6495	71.0919	0.2483	0.8050
D_3pop	-42.5877	42.6725	-0.9980	0.3233
cra	2.6288	0.5638	4.6627	0.0000
D_1cra	1.2881	1.3292	0.9691	0.3374
D_2cra	-2.4575	5.7262	-0.4292	0.6697
D_3cra	0.5397	0.9242	0.5840	0.5620
pci	0.0245	0.0160	1.5359	0.1311
D_1pci	-0.0175	0.0534	-0.3270	0.7451
D_2pci	-0.0248	0.0268	-0.9262	0.3590
D_3pci	0.0947	0.0569	1.6629	0.1029

Since we observed that none of the differential intercepts and differential slope coefficients are significant, we conclude that there is no structural change in production of food grains among the four southern states of India during 2000-2015.

VI. CONCLUSIONS

In the present study, regression models are fitted for total population(pop), no. of medically certified deaths(mcd), enrolment in education(ee) and production of food grains(pfg). For testing the structural change Chow test and dummy variable method is applied to the data related to India and southern states of India during the period 2000-2015.

It is concluded that there is structural change in total population, enrolment in education and there is no structural change in the medically certified deaths during 2000-2007 & 2008-2015.Also there is structural change in enrolment in higher education and secondary education during 2000-2015. There is no structural change in production of food grains during 2000-2007 & 2008-2015 in India, Andhra Pradesh, Tamil Nadu, Kerala and Karnataka. There is no structural change in food grains among the four southern states of India during 2000-2015.

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VII. APPENDIX

Health Data

India					
year	pop	no. of birth	no. of death	hospitals	allopathic doctors
2000	10534.81	12946823	3789466	18218	555550
2001	10287.37	12993577	3961767	17952	577094
2002	10901.89	15645632	4436100	15393	607075
2003	11083.70	15290261	4569026	5479	625423
2004	11264.19	15777612	4487886	7029	643964
2005	11443.26	16394625	4602727	7008	675375
2006	11620.88	18121296	5298279	7663	700699
2007	11796.86	19469756	5804922	9976	731439
2008	11970.70	19993799	5638131	11289	761429
2009	12141.82	21292574	5677705	11613	793305
2010	12309.84	21430434	5690549	12760	816629
2011	12474.46	21836920	5735082	11993	922177
2012	12635.90	21951519	5850176	23916	883812
2013	12794.99	22482951	6086616	19817	918303
2014	12952.92	23001523	6138182	20306	938861
2015	13110.51	23136145	6267685	20306	960233

India					
Year	mcd	diabetes mellitus	malaria	pneumonia	tuberculosis
2000	510580	13952	931	3604	10463
2001	533920	13196	1015	3824	21076
2002	543391	15034	973	4063	27220
2003	586700	18833	1006	4165	31455
2004	603260	19104	949	3605	37639
2005	650507	21367	963	3513	56471
2006	720047	27713	1707	3342	64539
2007	798546	27257	1311	3456	64824
2008	878339	30534	1055	3871	66204
2009	946018	34488	1144	2961	66345
2010	940896	33556	1018	2921	63781
2011	965992	33593	754	2778	63265
2012	1005804	34891	519	3750	63261
2013	928858	28015	440	2919	63261
2014	1066221	33327	535	2661	62849
2015	1183052	40293	287	2410	60845

Education Data

India						
	Enrolment in education(millions)		Number of institutions		Number of teachers(000)	
Year	higher	Secondary	higher	Secondary	higher	secondary
2000	8.1	187.6	12112	956519	398	4937
2001	8.6	185.5	10406	971054	412	4983
2002	9.5	189.3	11418	1017159	427	5174
2003	10.7	202.5	12080	1033863	436	5527
2004	11.2	212.1	12482	1120487	457	5714
2005	13.0	219	13921	1194300	472	5833
2006	14.3	222.7	17332	1220728	488	6010
2007	15.6	228.1	20183	1260004	505	6288
2008	17.2	237.3	23505	1285991	522	6222
2009	18.5	240.0	28322	1330778	588	6346
2010	20.7	241.6	28288	1407959	699	6325
2011	27.5	248.1	44734	1399408	817	6494
2012	29.2	258.0	46651	1399185	934	6794
2013	29.6	254.2	47937	1500768	952	9022
2014	31.8	258.5	49094	1518160	1049	8269
2015	33.6	260.6	51534	1516892	1261	8562

Agriculture Data

Agriculture data: India				
year	Pfg	pop	Cra	pci
2000	209801.3	10534.81	188396	15881
2001	196813.8	10287.37	185340	16688
2002	212851.2	10901.89	188014	17782
2003	174771.4	11083.70	173889	18885
2004	213189.4	11264.19	189661	20871
2005	198362.8	11443.26	191103	23198
2006	208601.6	11620.88	192737	26003
2007	217282.1	11796.86	192381	29524
2008	230775.0	11970.70	195223	33283
2009	234466.2	12141.82	195328	37490
2010	218107.4	12309.84	189188	46117
2011	244491.8	12474.46	197683	53331
2012	259323.2	12635.90	195796	67839
2013	257134.6	12794.99	194246	68757
2014	265045.2	12952.92	200950	74920
2015	252022.9	13110.51	198360	86879

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Andhra Pradesh					Tamil Nadu				
year	Pfg	pop	Cra	pci	year	pfg	pop	cra	pci
2000	13696.2	760.45	13023	15427	2000	8968.8	616.00	6519	18367
2001	16029.2	765.42	13545	17195	2001	8616.8	621.83	6338	20367
2002	14835.5	777.10	12756	18573	2002	7731.9	627.42	6226	21239
2003	10653.6	786.16	11559	19434	2003	4442.1	663.32	5191	21738
2004	13697.0	795.02	12366	21931	2004	4406.6	638.83	5316	24087
2005	13396.0	803.69	12519	23925	2005	6175.8	644.16	5889	27512
2006	16951.0	812.19	13362	26662	2006	6127.2	644.16	6033	31663
2007	16229.0	820.49	12811	30439	2007	8263.0	654.35	5843	37190
2008	19303.0	828.58	13567	35600	2008	6582.3	659.19	5815	40757
2009	20421.0	836.49	13830	40902	2009	7102.3	663.86	5824	45058
2010	15295.0	841.29	12560	52814	2010	7511.4	676.32	5572	63547
2011	20315.0	846.66	14512	62912	2011	7594.9	721.39	5753	72993
2012	18363.1	857.44	13759	71540	2012	10151.8	732.21	5890	84058
2013	10429.8	864.76	13650	72301	2013	5592.8	743.19	5140	98628
2014	10522.3	493.87	8128	81397	2014	8783.2	754.79	5897	112664
2015	10494.1	513.40	7690	90517	2015	9623.7	766.56	5995	128366

Kerala					Karnataka				
year	Pfg	pop	cra	pci	year	pfg	pop	cra	pci
2000	793.1	317.57	3002	18117	2000	9859.3	525.22	12097	17502
2001	765.1	319.72	3022	20107	2001	10986.0	533.21	12284	18344
2002	718.9	323.03	2992	20287	2002	8696.7	539.69	11670	18547
2003	699.7	325.91	2970	22776	2003	6664.6	553.27	11532	19621
2004	579.0	328.75	2954	24492	2004	6562.1	559.92	11450	20901
2005	670.9	331.54	2996	27048	2005	10495.0	566.47	12807	26882
2006	638.3	334.26	2986	36276	2006	13489.0	572.92	13027	31239
2007	640.5	336.94	2918	40419	2007	9599.0	579.27	12438	35981
2008	539.7	339.58	2761	45700	2008	12186.0	585.52	12893	42419
2009	598.3	342.16	2695	53046	2009	11275.0	591.70	12368	48084
2010	610.8	344.67	2669	60264	2010	10955.0	597.80	12873	51364
2011	527.1	347.08	2647	71434	2011	13877.3	603.82	13062	62251
2012	572.1	335.52	2662	83725	2012	12095.1	609.75	12059	68053
2013	511.8	337.15	2592	91567	2013	10863.3	615.60	11748	77168
2014	512.0	338.79	2617	103820	2014	12208.9	640.55	12267	89545
2015	563.8	340.40	2625	138390	2015	12138.0	650.61	12247	102324

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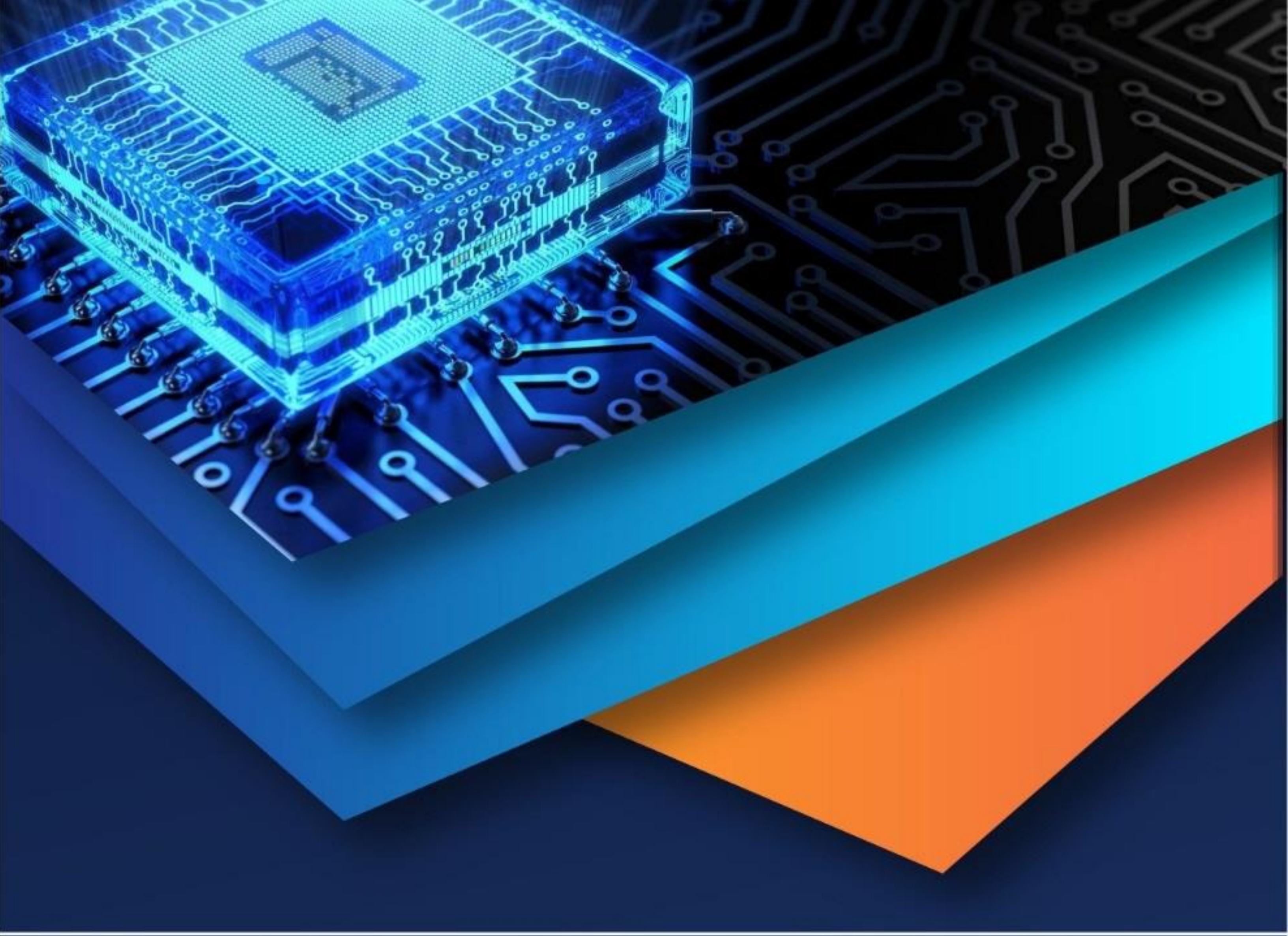

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