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# An Application of Multivariate Analysis on Socio Economic Indicators in Gujarat

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**ABSTRACT**

The use of statistical measurement tools to research human behavior in a social environment is known as social statistics. Statistics and statistical analysis has become a key feature of social science. In this study researcher study Socio Economics indicators like Education, Health and Employment in Gujarat, he also used Multivariate Analysis as a statistical tools. In this research it will be found that the most of the Sub Indicators are positively impact on Multivariate Analysis model.

***KEYWORDS:*** *Multivariate Analysis, Social sector, Social Indicator, Correlation*

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## 1. THE CONCEPT OF SOCIAL SECTOR AND SOCIAL INDICATORS

Social statistics is the use of statistical measurement systems to study human behavior in a social environment. This can be accomplished through polling a group of people, evaluating a subset of data observations and statistical analysis of a set of data that relates to people and their behaviors.

Social researcher have used social statistics for many purposes including

1. The evaluation of the quality of services available to a group of people.
2. Analyzing behaviors of groups of people in their environment and special situations.
3. Determining the needs of people through statistical sampling approach.

Statistics and statistical analysis have become a key feature of social science. Statistics is of basic importance in all the behavioral sciences like Economics, Psychology, Political science, Sociology, Education etc. The use of statistics is so wide spread in the social science that many institutes such as Harvard also have developed statistical institutes which can focus on the quantitative aspects of social science. In some places they have developed departments of decision sciences for study and research works to be executed in different disciplines.

## 2. SOCIAL SECTOR

All social sector statistical activities for collection, presentation and interpretation of data at central and state levels are grouped generally under the following categories of classification. (1) Human Development (2) Education (3) Health services (4) Women and child Development (5) Water supply and Sanitation (6) Rural development (7) Rural Housing (8) Urban development and urban Housing (9) Employment and training (10) Welfare of weaker sections (11) Women Welfare (12) Environment (13) Ecological education etc.

The statistical information under each of the above heads are collected, compiled and published at state as well as at central levels. Each of the components in the above list represents specific situations and corresponding policies taken by the government and they are clearly mentioned in the publication year wise.

## 3. OVERVIEW OF ECONOMY FOR ALL INDIA

GDP at current prices for the year 2012-13 is estimated at Rs.99.9 Lakh crores and that for 2013-14 is estimated at Rs.113.5 Lakh crore. This shows a growth of 13.1% and 13.6% during these years. Real GDP (i.e., GDP at constant prices stands at Rs. 92.8 Lakh crores for 2012-13 and Rs. 99.2 Lakh crores for 2013-14). This shows growth of 5.1% during 2012-13 and 6.9% during 2014-15 is estimated as Rs. 106.57 Lakh crores, showing a growth of 7.4 percent. Per capita at current prices is Rs. 71,593 and Rs. 80,388 for years 2012-13 and 2013-14 respectively. For the year 2014-15 it is estimated to be Rs.88, 538 thus showing a rise of 10.1% as compared to previous year. Per capita income at constant prices (2011-12) is estimated at Rs. 66,344 and Rs. 69,959 for the years 2012-13 and 2013-14 respectively. During the year 2014-15, it is estimated to be Rs. 74,193 thus showing a rise of 6.05% as compared to previous year.

## 4. OVERVIEW OF ECONOMY FOR GUJARAT STATE

Gross state Domestic Product (GSDP) at factor cost at constant prices in 2013-14 has been estimated at Rs. 4,52,625 crore as against Rs. 4,16,163 for 2012-13 showing a growth of 8.8% GSDP at factor cost at current prices in 2013-14 has been estimated at Rs. 7,65,638 crores as against Rs. 6,58,540 crores in 2012-13 thus showing a growth of 16.3% during the year. The share of primary, secondary and tertiary sectors has been reported as 22.1%, 43.1% and 43.8% respectively to total GSDP in 2013-14 at current prices. Per capita NSDP at factor cost at constant prices is estimated at Rs. 63,168 in 2013-14 as against Rs. 59,157 in 2012-13 thus showing a growth of 6.8% during the year. Per capita NSDP at factor cost at current prices has been estimated at Rs. 1,06,831 in 2013-14 as against Rs.93046 in 2012-13 thus showing an increase of 14.8% during the year.

## 5. DIFFERENT TYPES OF INDICATORS

Keeping in view the social sector some major indicators can be listed briefly as under:

1. Human Development Index (HDI) and its ranking (It is for country wise comparison and the same at state level SHDI can be helpful for state wise comparison).
2. Education (Quality of Education, Education Expenditures, Drop out ratios, student/teacher ratio etc.)
3. Health (Different Health Indicators, Health Expenditures, Expenses on health to GDP, public health expenditure to total budget etc.)
4. IMR, MMR, CBR, CDR, Life expectancy at birth etc.
5. Housing (Urban and Rural) (Average household size, total number of houses, House occupancy, Housing finance, Affordable housing needs, Employment
6. Water supply and Sanitation etc.
7. Environment etc.

## 6. CORRELATION AND CROSS CORRELATION

This study is constructed with one important objective that is to examine the actual impact of HDI and it's compared with experts' opinion. Thus, the study region Ahmedabad district is selected as study area and for the years 1999 to 2016 (seventeen years) of data for development indicators and HDI are taken as a secondary data. The data collection for Education, Health and Employment are taken as an indicators of development. The education indicators are growth of primary institutes (Growth Pri_ institu), total number of students enrolled and growth of primary students (Growth_Pri_student) during the given years, growth of secondary and higher secondary institute (Growth Sec_insti) along with growth of total number of students (Growth_Sec student), general enrollment ratio (GER), net enrollment ratio (NER) and lastly the dropout (Dropout) from schools during the given span of time. The second indicator under study is health. The health indicators are Crude Birth Rate (CBR), Death Rate (DR) and Infant Mortality Rate (IMR). The last list of variable is taken as skilled employment in district. The study of multiple regression is executed for all the listed parameters. The parameters have been tested for dependent variable Human Development Index (HDI).

### 6.1. CORRELATION

**TABLE 1 CORRELATIONS BETWEEN THE DEVELOPMENT INDICATORS**

| | HDI | Growth Pri_institu | Growth_Pri_ student | Growth_ Sec_insti | Growth_Sec student | GER | NER | Dropout | Skilled Employment Growth | CBR | DR | IMR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HDI | 1 | -.031 | .065 | -.363 | -.487 | -.122 | **.795** | **-.775** | .366 | **-.904** | **-.925** | **-.943** |
| Growth Pri _institu | -.031 | 1 | **.617** | -.068 | -.153 | -.272 | -.123 | .039 | -.287 | .093 | .047 | .064 |
| Growth_Pri _student | .065 | **.617** | 1 | .048 | **-.590** | -.204 | .121 | -.061 | -.382 | -.067 | .030 | -.058 |
| Growth_Sec _insti | -.363 | -.068 | .048 | 1 | .209 | -.242 | -.095 | .294 | -.221 | .209 | .349 | .257 |
| Growth_Sec student | -.487 | -.153 | **-.590** | .209 | 1 | .062 | -.482 | .303 | .020 | .435 | .424 | .479 |
| GER | -.122 | -.272 | -.204 | -.242 | .062 | 1 | -.150 | .015 | **.608** | .368 | .264 | .339 |
| NER | **.795** | -.123 | .121 | -.095 | -.482 | -.150 | 1 | **-.920** | **.514** | **.913** | **-.836** | **-.862** |
| Dropout | **-.775** | .039 | -.061 | .294 | .303 | .015 | **-.920** | 1 | **-.641** | .851 | **.824** | **.797** |
| Skilled Employment Growth | .366 | -.287 | -.382 | -.221 | .020 | **.608** | **.514** | -.641 | 1 | -.310 | -.390 | -.284 |
| CBR | **-.904** | .093 | -.067 | .209 | .435 | .368 | **.913** | **.851** | -.310 | 1 | **.940** | **.983** |
| DR | **-.925** | .047 | .030 | .349 | .424 | .264 | **-.836** | **.824** | -.390 | **.940** | 1 | **.959** |
| IMR | **-.943** | .064 | -.058 | .257 | .479 | .339 | **-.862** | **.797** | -.284 | **.983** | **.959** | 1 |

The listed parameters have been tested on basic path. The study of correlation shows the interrelation of the variables. It is giving an idea about the close impact of variable. It also helps to conclude the inclusive and exclusive impact of the parameters on HDI. The standard value for testing is taken 0.5 of r. Those variables having at least 50% impact on each other are concluded. As it shows higher internal relativity. The bold figures in table 1 shows higher (positive or negative correlation) between the variables. The net enrollment ratio is positively affect to HDI. It shows 79.5% direct impact. It is clear that higher the enrolled students get educated and the nation will have learned mass in future. Thus, it is easier to employ them in future. Moreover, the educated population will have faster growth. It shows 63.2% ($R^2 = 0.632$) inclusive impact on HDI. On other hand the dropout is not a good sign for development. It has negative relation with HDI. It is computed -0.775. It shows 77.5% impact of dropout on HDI. There are so many reasons for dropout of students from school. It can be measured by taking the determination of r. The $R^2 = 0.6006$ shows 60.06% dropouts are inclusive reasons and other 39.94% are exclusive reasons for dropout of the students from school. Higher the birth rate causes higher growth in population. To accommodate the upcoming population in each era will be the difficult to maintain the economy. The population growth is the major problem for developing countries. The result

of crude birth rate signs negative towards the HDI. It shows -0.904 co-efficient value. It has 90.4% negative impact of HDI. The inclusive results are also shows 81.72% effect to HDI. Higher the death rate is also one of the result to stuck-up the growth. The death rate is recorded with 0.925 negative. It has 92.5% negative relation to the HDI. The infant mortality is having negative relation with HDI. It is computed 94.3% results towards HDI.

The growth of primary institute is found lower. Thus, it has lower relation to the growth of total students studying in primary schools. The relation between the growths of primary level institute with total students studying in primary education is computed 0.617, shows 61.7% effect of interrelation of the variables. The calculation of percentage represents that there is lower availability of primary sector schools and students enrolled. It has indirectly reduce the development. The variables are positively associated, but it shows lower impact to development. The students enrolled in primary sector should exceed their study to next standard. Table 4.19 indicates that the relation between the total growth of primary students and secondary students negative. It is computed -0.59, shows 59% negative relation between the variables. The figure indicates higher dropout. The education system of Ahmedabad district designed the primary education up to standard seven. From standard eight onwards the students are enrolled for secondary and higher secondary education. Due to one or other reason, parents are not ready to educate their wards and it causes dropout. So after completion of primary education most of the students are not registered their candidature for next standard. Thus, the ratio is computed negative. Negative the value restrict the growth.

Gross enrolled ratio and net enrolled ratio indicates total enrollment in primary education. The students who have completed their education are eligible to develop their skills. The skilled populace is getting a better opportunity in market. The coefficients of GER and NER towards skilled employment are found 0.608 and 0.514. It depict that 60.8% and 51.4% bearing of GER and NER to the skilled employment. The net enrollment ratio for education have been studied for all parameters. Among them dropout is negatively associated (-0.920), the crude birth rate (0.913) has positively associated, the death rate (-0.836) and infant mortality rate (-0.862) are negatively linked to net enrollment ratio. It can be seen that dropout of students reduce the NER. The percentage of dropout is computed 92%, indirectly is stated lower growth. Higher the death rate and infant mortality rate obviously caused to reduce the net enrollment. The born children and living up to the age of 6 years having higher proportion to net enrolled ratio. The increase in crude birth rate positively relate to the net enrolled ratio. It is counted 91.3%. The Skilled Employment Growth is measured with influence of dropout it is found negative -0.641. It shows 64.1% negative impact of dropouts on total skilled employment growth. Higher the birth may cause higher death. The birth and death are positively related. The correlation between crude birth rate to death rate and infant mortality rate is measured. Both the parameters computed with higher value of co-efficient. It shows the co-efficient of CBR and DR is 94% and for CBR and IMR it is computed 98.3%. The infant mortality rate having higher value to CBR than DR. The higher value of infant mortality indicates to improve the health of mother while child bearing age group and tenure of pregnancy. Infant mortality is the proportion to total children died below the age of one year and total population. Indirectly is indicates the death of children. Thus, the co-efficient of IMR and DR is found higher. It is 0.959, shows 95.9%.

### 6.2. CROSS CORRELATION OF HDI WITH SELECTED VARIABLES

The cross connection work is utilized to establish that there is a connection between two given arrangement. To finish up whether an affiliation happens between the two arrangements, search for an enormous connection, with the relationships on the two sides that quickly become non-noteworthy. For the most part, a relationship is huge when the supreme worth is discovered more noteworthy than $\frac{2}{\sqrt{n-|k|}}$, here n is the quantity of perceptions and k is the complete slacks. This figuring is considered as a thumb rule practice to look at cross connection. In the event that the cross relationship of slack k is zero for k = 1, 2 ... n, at that point for all n, cross relationship of slack k will be approximate Ordinarily dispersed with mean μ =0 and standard deviation (σ) $\frac{1}{\sqrt{n-|k|}} = 1$. Table 4.20 is representing the calculation of cross correlation for three lags of listed parameters towards HDI.

As per the thumb rule calculation total eleven variable (n = 11) are taken to test the cross correlation. The estimation is compiled for 3 lags (k = 3). Thus, the standard value for testing the significance level of cross correlation can be presented as follows:

$$T = \frac{2}{\sqrt{n-|k|}} = \frac{2}{\sqrt{11-|3|}} = 0.707$$

If value of the computed lag is higher than the T value it is significant and if it is lower than the T value the correlation is not significant towards the HDI. The results are pressed in table 4.20 and 4.21 respectively.

**TABLE 2 CROSS CORRELATION OF VARIABLES TO HDI**

| Lag | Growth_ Prim_Inst | Growth_ Prim_ Students | Growth_ Secn_Inst. | Growth_Secn _Students | GER | NER | Dropout | CBR | IMR | Skilled Empl | DR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| -3 | 0.385 | 0.188 | -0.195 | -0.154 | -0.291 | -0.288 | -0.210 | -0.287 | -0.288 | -0.332 | -0.286 |
| -2 | 0.012 | -0.028 | -0.256 | -0.155 | -0.263 | -0.265 | -0.179 | -0.260 | -0.260 | -0.242 | -0.256 |
| -1 | 0.007 | 0.279 | -0.559 | 0.132 | -0.594 | -0.595 | -0.567 | -0.597 | -0.602 | -0.429 | -0.596 |
| 0 | 0.328 | 0.491 | **0.905** | 0.167 | **0.977** | **0.976** | **0.968** | **0.982** | **0.988** | 0.454 | **0.984** |
| 1 | 0.193 | 0.096 | -0.687 | -0.426 | -0.589 | -0.587 | -0.565 | -0.594 | -0.604 | -0.454 | -0.597 |
| 2 | 0.138 | 0.042 | -0.237 | -0.202 | -0.286 | -0.284 | -0.217 | -0.285 | -0.289 | -0.394 | -0.287 |
| 3 | 0.366 | 0.392 | -0.220 | 0.143 | -0.267 | -0.262 | -0.294 | -0.268 | -0.272 | -0.236 | -0.271 |

**TABLE 3 SIGNIFICANCE OF CROSS CORRELATION OF VARIABLES TO HDI**

| Lag | Growth_ Prim_Inst | Growth_ Prim_ Students | Growth_ Secn_Inst. | Growth_Secn _Students | GER | NER | Dropout | CBR | IMR | Skilled Empl | DR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| -3 | 0.385 | 0.188 | -0.195 | -0.154 | -0.291 | -0.288 | -0.210 | -0.287 | -0.288 | -0.332 | -0.286 |
| -2 | 0.012 | -0.028 | -0.256 | -0.155 | -0.263 | -0.265 | -0.179 | -0.260 | -0.260 | -0.242 | -0.256 |
| -1 | 0.007 | 0.279 | -0.559 | 0.132 | -0.594 | -0.595 | -0.567 | -0.597 | -0.602 | -0.429 | -0.596 |
| 0 | 0.328 | 0.491 | **Significant** | 0.167 | **Significant** | **Significant** | **Significant** | **Significant** | **Significant** | 0.454 | **Significant** |
| 1 | 0.193 | 0.096 | -0.687 | -0.426 | -0.589 | -0.587 | -0.565 | -0.594 | -0.604 | -0.454 | -0.597 |
| 2 | 0.138 | 0.042 | -0.237 | -0.202 | -0.286 | -0.284 | -0.217 | -0.285 | -0.289 | -0.394 | -0.287 |
| 3 | 0.366 | 0.392 | -0.220 | 0.143 | -0.267 | -0.262 | -0.294 | -0.268 | -0.272 | -0.236 | -0.271 |

The cross correlation results for growth of secondary institute, gross enrolled ratio, net enrolled ratio, total dropouts, crude birth rate, infant mortality rate and death rate are significant. The parameters which are linked with the stated variables are having impact on HDI. The listed all eleven are the indicators of development. The non-significant indicators are important, but the cross correlation stated the more important variables. The calculation deny that the skilled employment is not much effective if the education growth is not maintained properly. Similarly, the growth of secondary and higher secondary level institutes are exhausted if and only when primary education level is getting developed. Out of listed eleven parameters majority are found significant thus, statistically it allow us to test the functional relationship between the variables and also permit to construct the equation of regression for estimation. The next phase of study is presenting the calculation of regression analysis of development indicators.

## 7. COLLINEARITY IN REGRESSION MODEL

To know the practical association between the variables and to dignified unit changes effect of variables multiple regressions is used. Before that it is essential to inspect the co-linearity amid the variables. Collinearity generated by inner influences of the sovereign variables that may result on assessed values of figures or coefficients and results of regression model may very than the actual forecast. Thus, the details of projected regression function can be deliberate by using variance inflation factor (VIF). The standard error of the B weight with all sovereign variables can be define by using,

$$\sigma_{by1.2.3...k} = \sqrt{\frac{\sigma^2_{y1.2.3...k}}{\sum x_i^2 (1 - R^2_{1.2.3...k})}}$$

The terms are the squared correlation where sovereign first variable is measured as a reliant variable, same way all other sovereign variables have been calculated and the results are presented in table 4.

**TABLE 4 COLLINEARITY DIAGNOSTICS**

| Dimension | Eigen value | Condition Index | Variance Proportions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Constant | Growth_ institu | Growth_ student | Growth_ insti | growth_ student | GER | NER | Dropout | Skilled Employment Growth | CBR | DR | IMR |
| 1 | 8.211 | 1 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 2 | 1.773 | 2.152 | .00 | .01 | .02 | .00 | .02 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 3 | .965 | 2.92 | .00 | .00 | .00 | .00 | .03 | .00 | .00 | .00 | .02 | .00 | .00 | .00 |
| 4 | .529 | 3.941 | .00 | .11 | .00 | .01 | .06 | .00 | .00 | .00 | .01 | .00 | .00 | .00 |
| 5 | .284 | 5.381 | .00 | .01 | .03 | .19 | .02 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 6 | .146 | 7.51 | .00 | .18 | .20 | .12 | .13 | .00 | .00 | .00 | .00 | .00 | .00 | .00 |
| 7 | .089 | 9.618 | .00 | .00 | .06 | .00 | .00 | .00 | .00 | .05 | .11 | .00 | .00 | .00 |
| 8 | .004 | 43.25 | .00 | .01 | .24 | .01 | .23 | .00 | .00 | .27 | .13 | .00 | .00 | .03 |
| 9 | .000 | **190** | .00 | .04 | .03 | .06 | .02 | .01 | .00 | .00 | .04 | .01 | **.82** | .03 |
| 10 | .000 | 251.8 | .00 | .08 | .22 | .21 | .03 | .28 | .01 | .27 | .47 | .00 | .03 | .02 |
| 11 | 2.148E-5 | **618.2** | .00 | **.47** | .13 | .00 | .00 | .60 | .04 | **.36** | .21 | **.45** | .15 | **.54** |
| 12 | 2.611E-6 | **1773** | **.99** | .08 | .07 | **.39** | **.45** | .10 | **.95** | .04 | .00 | **.54** | .00 | **.39** |

The value for usual VIF can be figured by taking slanting rudiments of $R^{-1}$. The inverse of sovereign variable matrix, called $\beta = R^{-1}.r$, so the value of weights for calculated the results can be found. The theory of VIF shows that higher the value of $r_{12}^2$ caused to greater value of VIF. Thus, the tolerance value of each independent variable can be calculated by $1 - R^2 = \frac{1}{VIF}$ for each of the sovereign variable.

Smaller value of tolerance i.e. closed to zero caused trouble to the estimation. The results of collinearity can also arbiter by taking condition indices. The calculation of condition indices is fetid a correlation matrix into linear grouping of variables. The linear grouping are designated for the highest value as first largest variance, the second is with the next highest variance subject to being uncorrelated with first variable and same way each of the values can be measured. The variance explained by each of the linear grouping is defined as eigenvalue. Based on the theoretical framework table 4 can be determined for results. The variance fraction for each of the variable has been deliberate. It can be seen that dimension 12 is highly related with

growth of secondary and higher secondary institutes (39%), growth of the students of secondary and higher secondary students (45%), Net enrolled ratio (95%), crude birth rate (54%), and infant mortality rate (39%). The condition index computed 1773 higher for the said variables. Similarly the higher impact is computed for Growth of primary sector institutes (47%), dropout (36%), crude birth rate (45%) and infant mortality rate (54%). The said four independent variables are highly associated and that may affect the result of regression estimation. The Eigen value is computed most little and the condition index is recorded with 618.2. The third impacted list of variable is noticed for dimension nine – the death rate has higher fluctuation of 82% with value of condition index 190. Amid the said sovereign variables, which shows the major influence on model can be studied by using of tolerance level of variables in table 4.

## 8. REGRESSION MODEL

Multiple regression is an addition of ordinary least square (OLS). It is used to envisage the value of a variable based on the value of more than two variables. The variable required to be predict is called the dependent variable or criterion variable. The variables support the value of the reliant variable are called the independent or explanatory variables. It is also help to determine the explained variance of the model contribution of each of the predictors to it. The first table of concern study is discussed with model summary, it is given in table 5. It is given the discussion about R, $R^2$, adj. $R^2$ and the SE of the estimate, it is giving an idea about the model fitting of multiple regression. The R value in model summary table shows 0.984, it is multiple correlation co-efficient of the model.

**TABLE 5 MODEL SUMMARY**

| R | $R^2$ | Adj. $R^2$ | SE | Change Statistics | | | | | Durbin-Watson |
|---|---|---|---|---|---|---|---|---|---|
| | | | | $R^2$ Changed | F Changed | df1 | df2 | Sig. F Change | |
| .984 | .968 | .897 | .027 | .968 | 13.642 | 11 | 5 | .005 | 2.630 |

R can be considered to be one measure of the value of the estimate of the dependent variable. A value of 0.984 is indicates a good level of prediction. The $R^2$ column signifies the coefficient of determination, which is the ratio of variance in the dependent variable that can be explained by the independent variables, it is the part of variation taken by the regression model. It can be seen value of 0.968 that independent variables explain 96.8% of the variability of dependent variable. It is also infer in terms of adjusted $R^2$ to exactly report data.

**TABLE 6 ANOVA**

| Model | SS | df | MSS | F | Sig. |
|---|---|---|---|---|---|
| Regression | .108 | 11 | .010 | 13.642 | .005 |
| Residual | .004 | 5 | .001 | | |
| Total | .112 | 16 | | | |

The F-statistics – analysis of variance is studies whether the overall regression model is a good fit for the data or not. The table 6 shows that the independent variables statistically predict the dependent variable, $F(11, 5) = 13.64$, $p < 0.005$ - i.e., the regression model is a good fit of the data.

Following is the table of regression co-efficient relate to the dependent variable HDI. There are total elven variables affects the HDI. The individual effect of each of the variable is presented in table 6. The constant of the model is found positive. Thus, negative the value of independent variable reduce the constant and positive the value of coefficient increase the value of constant. The basic multivariable model can be rewrite as follows:

The simple multiple regression models can be determined as:

$$Y_x = \alpha + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n + \in$$

Thus we may finally write the multiple regression models as:

$$\begin{aligned} Y_{HDI} - \alpha &+ \beta_1 \text{Growth Prim Inst} + \beta_2 \text{Growth Prim Student} + \beta_3 \text{Grwoth Socon Inst} \\ &+ \beta_4 \text{Growth Secn Students} + \beta_5 \text{GER} + \beta_6 \text{NER} + \beta_7 \text{Dropout} \\ &+ \beta_8 \text{Skilled Employment Growth} + \beta_9 \text{CBR} + \beta_{10} \text{DR} + \beta_{11} \text{IMR} + \in \end{aligned}$$

**TABLE 7 COEFFICIENTS**

| | Unstand Coeff. | | Stand.Coeff. | t | Sig. | 95.0% Confi. Interval for B | | Collinearity Statistics | |
|---|---|---|---|---|---|---|---|---|---|
| | B | SE | Beta | | | Lower Bound | Upper Bound | Tolerance | VIF |
| Const. | 2.516 | 3.043 | | .827 | .446 | -5.305 | 10.34 | | |
| Growth_institu | .011 | .008 | .266 | 1.359 | .232 | -.010 | .032 | .168 | 5.948 |
| Growth_student | .004 | .008 | .152 | .572 | .592 | -.025 | .016 | **.091** | 10.97 |
| Growth_insti | .004 | .005 | .112 | .720 | .504 | -.009 | .016 | .265 | 3.780 |
| growth_student | .001 | .004 | .061 | .269 | .799 | .011 | .009 | .127 | 7.868 |
| GER | .017 | .008 | .718 | 2.231 | .076 | -.003 | .036 | **.062** | 16.05 |
| NER | .017 | .025 | .389 | .693 | .519 | -.081 | .046 | **.021** | 48.77 |
| Dropout | -.001 | .003 | -.135 | -.288 | .785 | -.007 | .009 | **.029** | 34.21 |
| Skilled Empl. Growth | .005 | .005 | .328 | .988 | .368 | .017 | .008 | **.058** | 17.09 |
| CBR | -.078 | .072 | -1.630 | -1.08 | .330 | -.264 | .108 | **.003** | 354.3 |
| DR | -.054 | .062 | -.348 | -.874 | .422 | -.212 | .104 | **.041** | 24.57 |
| IMR | -.002 | .010 | -.188 | -.159 | .880 | -.023 | .026 | **.005** | 216.2 |

The depicted model can be rewrite as:

$$Y_{HDI} = 2.516 + 0.011\ \text{Growth Prim Inst} + 0.004\ \text{Growth Prim Student} + 0.004\ \text{Grwoth Secon Inst} + 0.001\ \text{Growth Secon Student} + 0.017\ \text{GER} + 0.017\ \text{NER} - 0.001\ \text{Dropout} + 0.005\ \text{Skilled Employment Growth} - 0.078\ \text{CBR} - 0.054\ \text{DR} - 0.002\ \text{IMR}$$

**CONCLUSION:**

The study of correlation is discussed to understand the direct relation between the variables. Statistically, the results are interrelated and sometimes the variable is associated with itself.

Table 7 shows the final presentation of multiple regression model. This model is defined for listed 11 independent variables relate to development and dependent variable HDI of Ahmedabad district for the year 1999 to 2017. The model is presented with constant of the model, standard values of co-efficient (beta), unstandardized co-efficient B, t statistics and standards of collinearity. The lower value of tolerance are computed for growth of primary student (**0.091),** GER (**0.062**) NER (**0.021),** Dropout (**0.029),** Skilled Employment Growth (**0.058),** CBR (**0.003),** DR (**0.041)** and IMR (**0.005).** Lower the value of tolerance indicates best fit of the model. The concluded results of model can be interpreted as follows:

The growth of primary institute (0.011) having positive impact on constant. It shows that increase in primary institute will result higher in development of education. As the total primary institute have positive impact on model indirectly the growth of total number of students will increase. It shows that the growth of primary students have increased 0.004 to HDI. Similarly, the growth of secondary institute and total number of secondary and higher secondary have positive impact on model. The growth of secondary and higher secondary level institute increases as 0.004 and for total number students' growth it is computed 0.001. Two other variable relating to education development are found positive towards the constant of HDI. GER (0.017) and NER (0.017) both the parameters shows equal impact to the constant. All the parameters of education have positive impact to development of HDI. It is advisable to focus more to increase the education related parameters to have increase in HDI. The only parameter of education is computed negative i.e. dropout of students. It clearly stated that higher the dropout reduce the HDI. The officials should design proper strategy to reduce total dropouts. The skilled employment growth is also have positive association towards the constant of model. It shows 0.005 value in increment of HDI. Health wise the district officials required to do more improvement majority of the indicators have negative sign towards the constant is shows reduction of HDI. Reduction in CBR is computed 0.078, the co-efficient of death rate is 0.054 and for infant mortality it is recorded 0.002. All the three health related indicators are computed negative with higher value of co-efficient.

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