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Social Development Indicators and their Association with Crime: A Case of Bihar, India

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Abstract: This paper analyses the time-series evidence of the effects of changing social development factors on crime for different types of crime. The study area of Bihar, a state in India, has been chosen for the present investigation. The correlation and regression analysis has been performed for establishing the fact that the crime shows relation with the social development factors; specific violent crime, such as murder and robbery, also display sensitivity to the development indicators over time. The paper concludes with a unified interpretation of the time-series data.

Key words: Regression; Correlation; Social development; Crime

I. INTRODUCTION

In a region, the level of crime is directly or indirectly associated to the level social development in terms of demography, education, income, poverty, health, awareness etc. Studies suggest that the inequality in terms of income and standard of living is one of the major instigating factors for the criminal activity [1, 2]. Some researches advocate that income-inequality results in some psycho-social processes, like reduces happiness; lack of satisfaction; desire of social status; and reduced faith in justice, which results in lowering the esteem of an individual, belonging to the economically vulnerable section, to commit crime [3]. The vast increase in population of the underdeveloped region lowers the per capita resource, results in the increase in inequality; and dissatisfaction among the vulnerable section. It is an established fact that there is a relation between the population density and the crime; the rate and size of crime increases with increase in the population density [4]. Due to large population, it becomes difficult for the institutions to maintain the surveillance or guardianship to prevent crime [5]. It has been observed that the rates of crime and deviant behaviour found more in the big cities than small towns or rural areas. The experiments done by the researchers in the social sciences suggest that when people are confronted with a large number of strangers in everyday life, they tend to take less interest in the community in order to shield themselves from burden; thus higher rate of urbanization results in the higher urban crime rates [6]. The high rise buildings and apartments; and lack of vegetation in the urban areas are the instigation factors for aggressive and violent behaviour of an individual, which lead them towards the criminal activities like murder and throbbing [7]. The researches show, the low literacy rate is related to crime depending upon its type, for instance cyber crimes are committed by the educated people [8]. The education, increases social awareness and emotional intelligence of an individual, is a guiding factor to prevent one from committing crime [9]. Besides, increased number of literates increases the disguised unemployment and competitiveness among the people in a region, resulting in the dissatisfaction followed by immoral deeds and criminal activities [10]. There has not been found specific relation between health condition and the crime, but the relation between mental health conditions in particular and the criminal activities, like brutal murder; rape; child abuse etc., has been explored in the literatures [11].

II. METHODOLOGY

The study area of Bihar, third most populous state in India, has been selected as it is one of the most underdeveloped regions with the third lowest rank, slightly better than Chhattisgarh and Odisha, in the HDI ranking list of Indian states, 2011. The time series data, for the years 2001 to 2011, collected from the secondary sources has been analyzed using correlation and regression analysis for the study area. The study concludes with discussing the association among the variables identified as the indicators of social development and their relation with the crime and the types of crime.

III. CRIME IN THE STUDY AREA

The comprehensive data pertaining to the type and the trend of crime for ten years from the year 2001 to the year 2011 has been analysed in the present study (Table I, Figure 1). The six major crimes, Murder; Rape, Kidnapping, Dacoity (when five or more persons conjointly commit or attempt to commit a robbery as per the Indian Panel Code), Robbery and Theft has been considered for analysing the trend of change in the criminal activities with time. Trend shows that there is a gradual increase in the number of all types of criminal cases considered during the year 2001 to 2004; the rate of increase has been found more in the year 2003-2004. After the year 2004, there has been observed a change of pattern in the trend of different type of crimes. In the year 2005, there is a sudden drop in all the crimes except the cases of theft. The Bihar police reforms, 2005 has played a major role in bringing down the rate of crime in the region [12]. About 23 per cent of decrease in murder case has been observed during the period of four years from the year 2004 to the year 2007. However, there is about 13 per cent increase in the number of murder cases after the year 2007 till 2010, which finally decreased about 5 percent in the year 2011. The result shows that there is total 11.6 per cent decrease (3619 murders in the year 2001 to 3198 murders in the year 2011) in the number of murders during the year 2001 to the year 2011. Unfortunately, the rape cases has shown a different trend with

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about 25 per cent (746 cases in the year 2001 to 934 cases in 2011) of increase during the decade from the year 2001 to the year 2011. After the year 2005, rape cased has mixed trend of increase and decrease in each successive year. The number of kidnapping cases has almost doubled during the year 2005 to the year 2011; it has increase almost 1.5 times during the decade (from 1689 kidnapping cases to 4268 kidnapping cases). The number of kidnappings has gradually increased with time except during the year 2005 to the year 2005. With exception of years, 2004 and 2009, the Dacoity cases have decreased to less than half during the year 2001 to 2011 (1293 cases to 556 cases). The cases of robbery has gradually increased up to 34 percent from the year 2001 till 2004, and then decreased gradually up to half till 2011, with a overall decrease of 36 per cent (from 2175 cases to 1381 cases) during the year 2001 to 2011. A completely different trend has been observed in case of increase in number of theft which has shown about 72 per cent (from 9489 cases to 16292 cases) increase, with gradual increase in each consecutive year, from the year 2001 to the year 2011.

TABLE I: Year wise crime statistics in bihar (2001 to 2011)

Sl. No.	Year	Type of Crime					
		Mur-der	*Rape*	*Kidna pping*	*Dac-oity*	*Rob-bery*	*Theft*
1.	2001	3619	746	1689	1293	2175	9489
2.	2002	3634	875	1948	1259	2236	9792
3.	2003	3652	804	1956	1203	2425	10313
4.	2004	3861	1063	2566	1297	2909	11518
5.	2005	3423	973	2226	1191	2379	11809
6.	2006	3225	1083	2301	967	2138	13092
7.	2007	2963	1122	2092	646	1729	12306
8.	2008	3029	1041	2735	640	1536	14143
9.	2009	3152	929	3222	654	1619	15221
10.	2010	3362	795	3674	644	1538	15544
11.	2011	3198	934	4268	556	1381	16292

Source: C.I.D., Government of Bihar

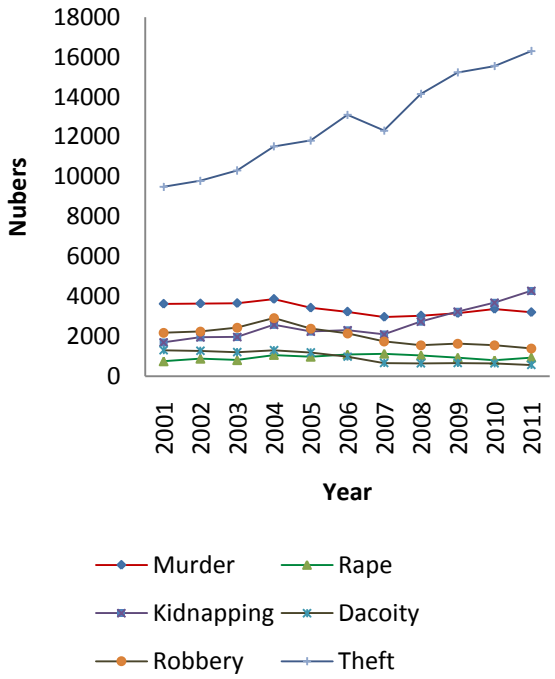

Figure 1. Year wise Crime Statistics in Bihar (2001 to 2011)

A. Correlation and regression analysis

The calculate correlation coefficient among the variables suggests, all the crime cases show strong correlation with time except the rape case. The murder case; dacoity case; and robbery case show negative correlation with time, which means the number of these cases decrease with the increase in time. Besides, the rape case; kidnappings; and theft case show positive correlation with time indicating the increase in number of cases with the increase in time. All the types of crime considered show strong correlation with each other except the rape case. The multiple linear regression model has been found significant and shows strong interrelation (r^2=0.99) between the selected variables (time, murder, rape, kidnapping, dacoity, robbery, and theft). The multiple linear regression model of crime is:

Y (time in years)= -0.0047 x (No. of Murders) - 0.0033 x (No. of Rapes) + 0.0019 x (No. of Kidnapping) - 0.0056 x (No. of Dacoity) + 0.0036 x (No. of Robbery) + 0.0003 x (No. of theft) + 0.0003

B. Weighted Index score

The type of cases has been considered as the attributes for calculating the weighted crime score employing the weighted index method. On the basis of the strength of correlation of the type of crime cases with time, the weights have been assigned to each attribute (crime cases). Thus, the scores assigned are: 0.7 for Murder; 0.3 for Rape; 0.9 for Kidnapping; 0.9 for Dacoity; 0.8 Robbery; and 1.0 for Theft. Now, we calculate the weighted crime score for crime using (1).

$$I_C=a_1X_1+a_2X_2+a_3X_3+.....+ a_nX_n \qquad (1)$$

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Where,
I_C is Weighted Crime Score;
$a_1, a_2, a_3, \ldots\ldots, a_n$ are the scores assigned to the attributes;
$X_1, X_2, X_3, \ldots\ldots, X_n$ are the value of attributes; and
n is the number of attributes.

Similarly, the weighted Social development score has been calculated using the above formula.

IV. CALCULATIONS

The weighed crime score has been calculated for each year under consideration and has been compared to the selected social development indicators, which are: Population Density; Literacy Rate; BPL Population; Percentage Urban Population; and Infant Mortality Rate (IMR) (Table II, Figure 2). The indicators have been selected to cover each parameter of the social development which includes the income dimension; health dimension; education dimension; and the demographic pattern. Further, the calculated correlation coefficients for the selected social development indicators, suggest that there is a strong correlation among them. All the indicators of development except the BPL population percentage and the IMR, show the positive correlation with time as well as the crime score (Figure 3, 4, 5, 6, 7 and 8). The weighted Social development score's graph has been plotted against the weighted crime score, which shows a negative and strong correlation between them (Figure 9).

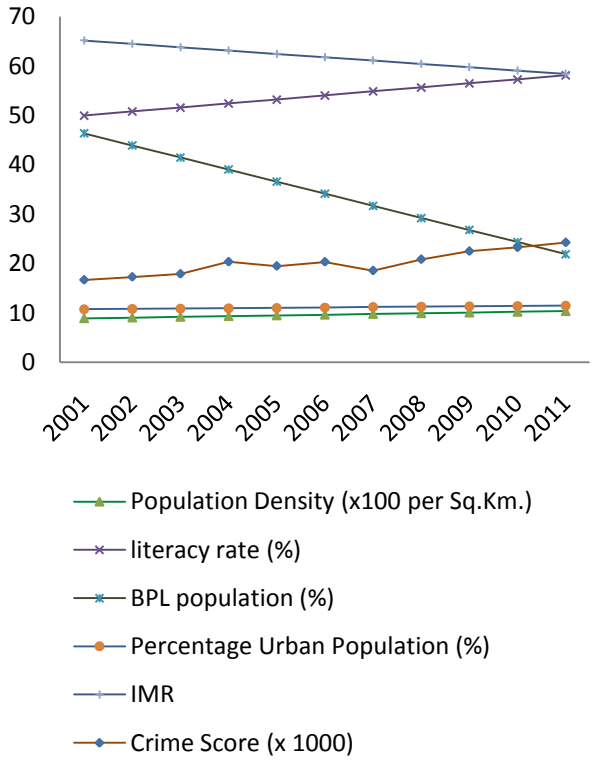

Figure 2. Year wise social development in Bihar

TABLE II: Year wise data showing the social structure of Bihar (2001 to 2011)

year	Population Density (per Sq.Km.)	Literacy Rate (%)	BPL Population (%)	Percentage Urban Population (%)	IMR	Crime Score
2001	890.54	49.92	46.35	10.72	65.12	16669.9
2002	905.09	50.73	43.91	10.80	64.45	17273.4
2003	919.63	51.55	41.46	10.87	63.77	17893.7
2004	934.17	52.37	39.01	10.94	63.10	20343.5
2005	948.71	53.19	36.57	11.01	62.42	19475.5
2006	963.26	54.00	34.12	11.09	61.75	20326.0
2007	977.80	54.82	31.68	11.16	61.07	18564.1
2008	992.34	55.64	29.23	11.23	60.40	20841.9
2009	1006.89	56.45	26.78	11.31	59.72	22489.7
2010	1021.43	57.27	24.34	11.38	59.05	23252.5
2011	1035.97	58.09	21.89	11.45	58.37	24257.2

Note: All the data has been estimated by the author on the basis of related data collected from the secondary sources: census of India; Office of the Registrar General of India, Ministry of Home Affairs; and Crime Investigation Department, Bihar, India.

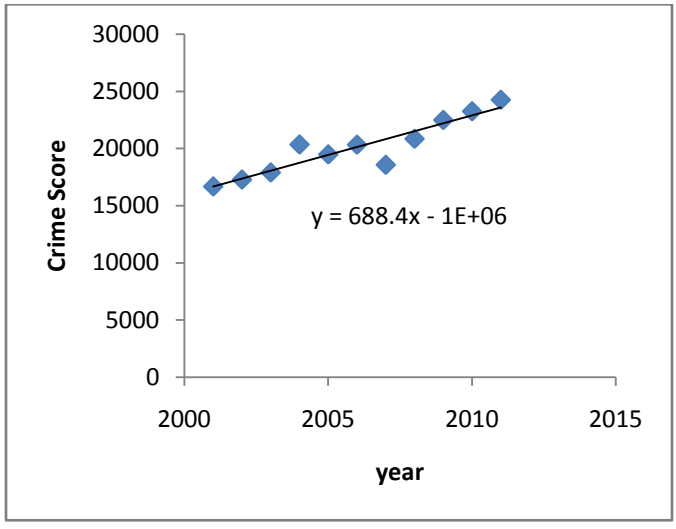

Figure 3. Crime Score vs. Time

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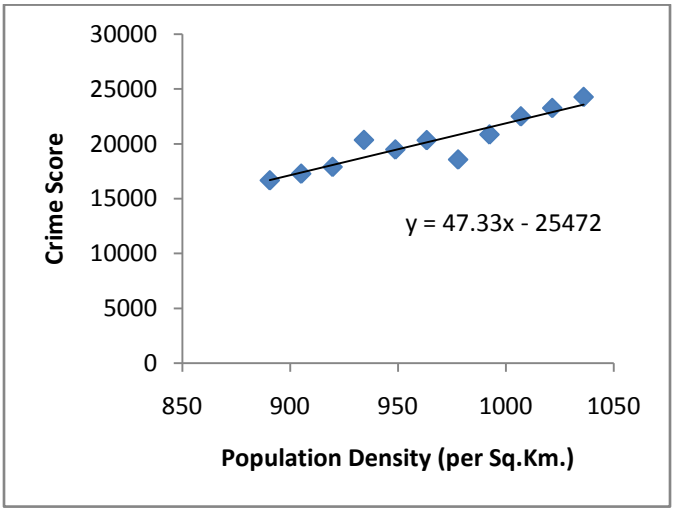

Figure 4. Crime Score vs. Population density

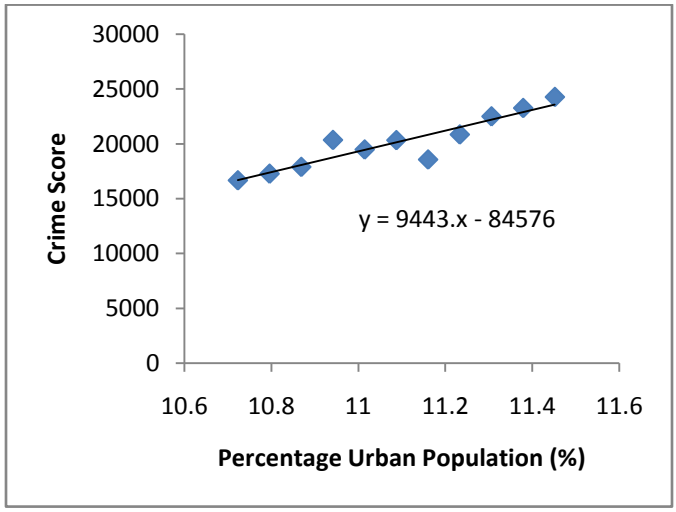

Figure 7. Crime Score vs. Percentage urban population

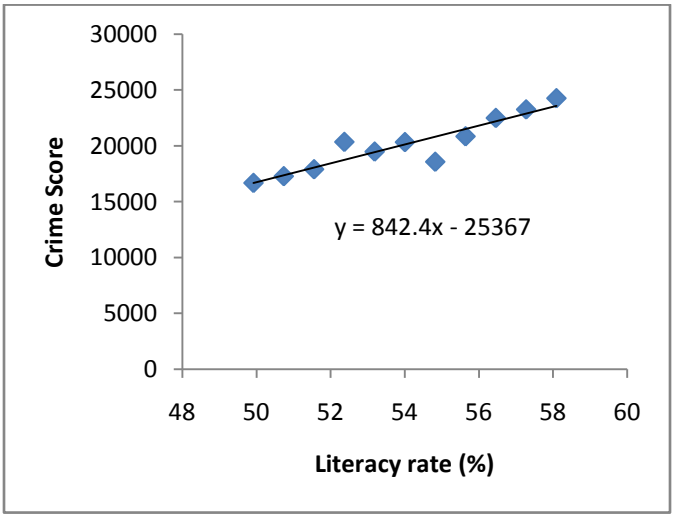

Figure 5. Crime Score vs. Literacy rate

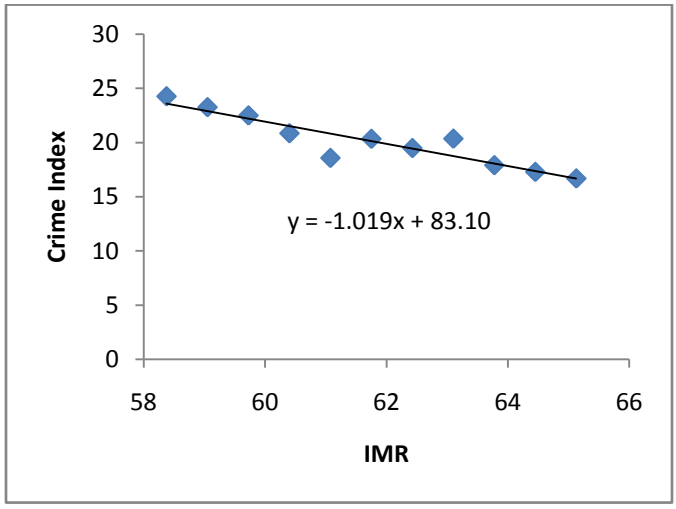

Figure 8. Crime score vs. IMR

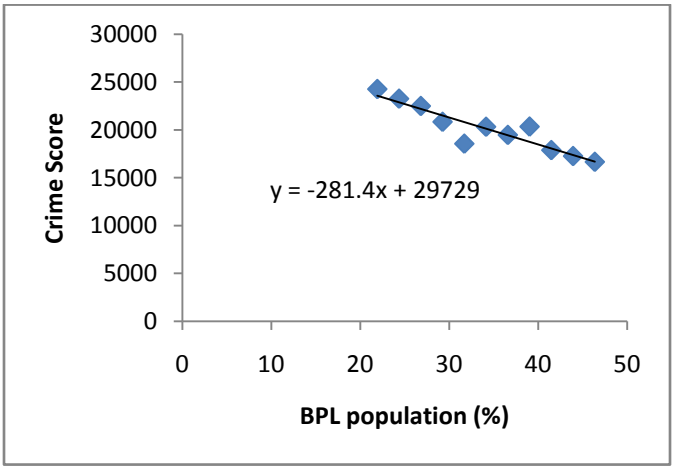

Figure 6. Crime Score vs. BPL population

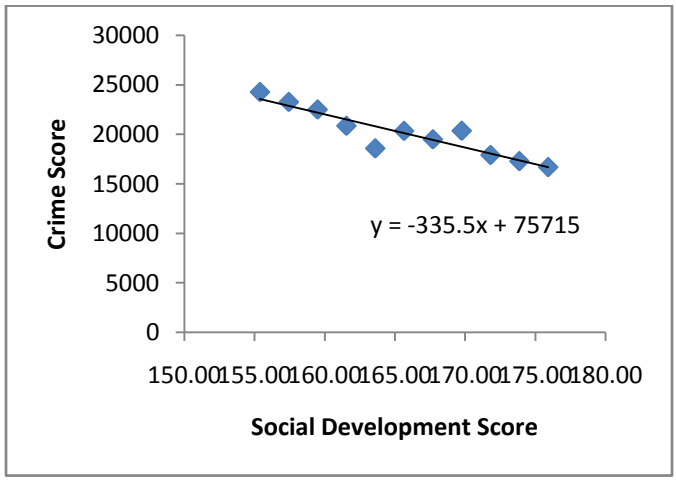

Figure 9. Crime score vs. Social development score

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V. RESULT AND DISCUSSION

Among all the crimes, the number and the rate of increase of the theft cases are much higher. There is a positive sign with decrease in the number of murder, Dacoity and Robbery cases with time. The population density and percentage urban population has increased with time. There is increase in health facilities, concluded with decreases in the IMR with time, which is the major cause of population growth. The literacy rate has increased and the BPL population percentage has decreased during the decade, which affirms the social development in the region. There is a strong correlation among the social development indicator; and their correlation with the crimes are also strong. The crime shows strong correlation with time. Each type of crime shows strong correlation with time except the rape cases. The weighted crime score shows strong negative correlation with the weighted social development score.

VI. CONCLUSION

Crime is a major obstacle in the way to achieve socio-economic development of a region. It is imperative to prevent a region from crime in order to achieve development goals; also, achieving crime prevention by the implementation of pro-active approach of socio-economic development by increasing education; health; and employment opportunities, and reducing poverty, is obligatory. The present analysis focuses on the root causes and risk factors of crime in the study area of Bihar, suggests the ways to prevent crime through socio-economic development. There is scope of further research to find out the interrelation between each types of crime with different social development indicators.

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