



Statistical Analysis on the Trend and Causes of Crime in Ho Municipality

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Abstract

This research work sought to estimate and analyze the causes and trend of crime in Ho Municipality. The research was carried out in Ho central of the Municipality where 102 respondents made up of police officers and prison officers were selected to complete a questionnaire asking them to indicate the level of importance attached to listed original factors considered to be the causes of crime in the Municipality. The raw data consists of 13 original factors subjected to correlation analysis to identify new composite factors that can explain the causes of crime in the Municipality. Using time series data (total quarterly crime for the major crime categories) covering the period of 2004 to 2014 obtained from the Regional crime unit of the Volta Regional command of the Ghana police service, and the prison service, an impact assessment model was obtained to determine the trend of crime in the municipality using time series analysis, the data was also used to forecast for the next six years. Information obtained from the field data was also used to determine the sex and age group that mostly engaged in crime in the Municipality. At the end, five factors were identified to be the major causes of crime, these are; parental neglect, poverty, unemployment, peer pressure and drug abuse. It has also been revealed that trend of crime is in the increase in the Municipality. Males and the age group of 16-35 years are found to engage in crime in the Municipality. Finally, we propose an alternative strategy to control crime by enhancing police efficiency that is by introducing volunteer reinforcement either by enlarging its size or by updating its technology, it is hoped that the findings of this research would prompt society to be mindful of criminal activities in the Municipality.

Keywords: Crime; burglary; larceny; municipality; binomial; time series analysis and Factor analysis.

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1 Introduction

Ghana has being one of the peaceful countries within sub-Saharan Africa. The serene atmosphere of the country and friendly disposition of Ghanaians offer visitors the necessary motivation to visit Ghana. For this reason, Ghana has earned global recognition and respect, and viewed as the gate-way to Africa. However, against the backdrop of a steadily improving global recognition, is the emergence of crime which are slowly but surely gaining root in the country.

The Ancient Greek word *krima* (κρίμα), from which the Latin cognate was derived, typically referred to an intellectual mistake or an offense against the community, rather than a private or moral wrong.

[2] defined crime as the breaking of rule(s) or regulation(s) for which a governing authority (via mechanisms such as legal systems) can ultimately prescribe a conviction. And according to [8], crime is a deviant behavior that violates prevailing norms or cultural standards prescribing how human beings behave in a society.

Therefore, based on the above definitions, crime can simply be defined as the breaking of rules or regulations or a deviant behavior that violates prescribed norms or values which is frowned upon by society.

Crime reports have become rampant in the media and the country as a whole.

Some specific crime-related issues and cases that have caused controversies in our media and society in recent times are the Johnson Kombian who broke jail on two occasions and has been reported to have killed two policemen, the murder of an American-British missionary who was kidnapped and killed by Ghanaians in Koforidua in the Eastern Region, the alleged mass rape story at Kintampo that has caused a lot of uproar among the general public, serial killing of women, highway robberies, vehicle snatching, illicit drug and child trafficking and many more.

Several forms of criminal activities occur in our societies which may be described as major or minor by virtue of their nature and impact. These are categorized and defined by [4], as follows:

1.1 Motor Vehicle Theft

The theft or attempted theft of a motor vehicle.

1.2 Burglary

The unlawful entry of a structure to commit a felony or a theft. Attempted forcible entry is included.

1.3 Robbery

The taking or attempting to take anything of value from the care, custody, or control of a person or persons by force, or threat of force, or violence, and/or by putting the victim in fear.

1.4 Larceny

The unlawful taking of property from possession of another.

1.5 Aggravated Assault

An unlawful attack by one person upon another for the purpose of inflicting severe or aggravated bodily injury.

1.6 Murder

The unlawful killing of one human by another, especially with premeditated malice.

1.7 Forcible Rape

The carnal knowledge of an individual against his or her will. Included are rapes by force and attempts or assaults to rape.

Notwithstanding the above, this paper make use of the following crime data obtain from Regional crime unit of the Volta regional command of the Ghana police service, and the prison service as follows;

Murder, Attempted Murder, Threatening, Causing crime, Assault, Robbery, Stealing, Fraud, Unlawful entry, Causing damage, Abduction, Rape, Dangerous drug, Forgery, Counterfeiting, False cheque, Defilement, Offensive conduct, Illegal felling of trees and others.

According [17], five degrees of offenses are recognized in Ghana. Capital offenses, for which the maximum penalty is death by hanging, include murder, treason, and piracy. First-degree felonies punishable by life imprisonment are limited to manslaughter, rape, and mutiny. Second-degree felonies, punishable by ten years' imprisonment, include intentional and unlawful harm to persons, perjury, and robbery. Misdemeanors, punishable by various terms of imprisonment, include assault, theft, unlawful assembly, official corruption, and public nuisances. Increased penalties apply to individuals with a prior criminal record. Corporal punishment is not permitted. Punishments for juveniles are subject to two restrictions: no death sentence may be passed against a juvenile, and no juvenile under age seventeen may be imprisoned. Regulations and laws such as these are not applied equitably. Indeed, defendants habitually resort to one or another measure to avoid or ameliorate punishment.

2 Literature Review

Firstly [1], studied and discussed the trends and patterns of robbery, and reactions to it in contemporary Ghana between 1982 and 1993. The study contends that robbery as a crime of opportunity appears to have been prevalent in pre-colonial times as well as during the subsequent period of slavery. Its trends and patterns however, have changed with the introduction of a monetary economy that has resulted in increased opportunities and targets for robbery. The descriptive statistical data derived from official police records concluded that even though the incidence and volume of robbery in Ghana is quantitatively small compared to the rates of other index offenses, and minuscule within the population at large, official reaction to it has been rather swift and merciless. No reason can be assigned to the executions other than deterrence, which raises questions as to its efficacy.

[3], analyzed existing and improved methods for forecasting incoming calls to telemarketing centers for the purposes of planning and budgeting. They also analyzed the use of additive and multiplicative versions of holt-winters exponentially weighted moving average models and compare it to box-jenkins (ARIMA) modeling with intervention analysis. They determine the forecasting accuracy of HW and ARIMA models for samples of telemarketing data and concluded that ARIMA models with intervention analysis performed better.

According to [2], the rate of crime needs to be seriously checked and dealt with because this issue is creating a lot of panic and fear in the country since Ghana is known for its peace and as a nation, we must help maintain this. The government should empower the police, military and other security agencies to help curb this problem because we as Ghanaians are now living in a period of great fear and panic.

Furthermore, [6], expressed in his article titled "increased crime rate in Ghana: a call for security reform" that Ghana is one of the peaceful countries within Sub-Saharan Africa. However, against the backdrop of a

steadily improving global recognition, is the emergence of a new trend of crimes which are slowly but surely gaining root in the country: serial killings, armed robbery, and cocaine trafficking. These social vices have created a negative impact on the good name of Ghana. On the social front, there is inflation in the country and standard of living has risen. Under such conditions, the temptation for people to engage in inelegant means of livelihood is high because the good old adage states that, “an idle hand is a devil’s tool.” Therefore the spate of armed robbery, cell phone snatching, and countless minor incidents are rooted to unemployment.

3 Methodology

3.1 Source of Data

The research made use of primary data obtained from prison and police officers in the Municipality. Secondary data was also obtained from the regional crime unit of police and prison service office in the Ho Municipality from 2004 to 2014.

3.2 Data Collection Procedure and Instrument Used

Questionnaires were the main instrument that was used to collect the primary data. A structure questionnaire was prepared and used during the gathering of information to ensure objectivity of the research. Open-ended questions were used as well as closed-ended questions. The questionnaire prepared was divided in to two sections. Part one carried personal information about the officers. Part two of it focuses on the causes of crime itself in general. With regard to the secondary data, the study made use of data on activities on crime from the central prison office and the central District police office in the Municipality.

3.3 Validity and Variability of Measurement

Data collected has been coded and theoretically edited by the researcher to ensure consistency and also to check omissions, non-response, validity and reliability of the responses. Both descriptive and inferential statistics are employed as the methods for data analysis. The descriptive methods include charts, tables and figures showing frequencies. Binomial test was used as a tool for the data analysis on the causes of crime. Furthermore, time series analysis has also been used to determine the trend of crime. Statistical package for social scientist (SPSS) was used as software for the analysis and micro soft excel was used to analyze the secondary data collected by the researchers.

3.4 Test of Reliability

In Table 1, it can be observed that the Cronbach alpha is almost 0.70 which indicates that the measurement is acceptable or there is a level of consistency in the data set. This further indicates that, 70% of the time, the variables are consistent among themselves.

Table 1. Test of reliability

Reliability statistics	
Cronbach's alpha	N of items
0.69	13

Source: Field Survey, 2014

3.5 Data Processing

Data collected was edited and coded. Data was edited to ensure consistency and to check for omissions, validity and reliability before coding it. Non responses were taken back to the field for re-eliciting. Coding is to allow for easy data entering and analysis.

4 Data Presentation, Analysis and Findings

For the interest of this study, the variables were labeled V_1 to V_{13} representing 13 original factors which were thought to have been the causes of crime in the Municipality. Here the research seeks to extract a manageable few variables which would still be able to explain the maximum correlation in the original variables. The level of importance attached to the indicator variable is the most concepts to determining which factors are responsible in explaining the causes of crime in Ho Municipality, the study area. Likert scale was used by the respondents in rating the variables;

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Maybe
- 4 = Agree
- 5 = Strongly Agree

Due to the large number of the basic indicator variables, and for easy presentation on a table, they are denoted as;

- V_1 = Poverty is the most cause of crime
- V_2 = Drug abuse is the most cause of crime
- V_3 = Unemployment is the cause of most crime
- V_4 = Social surrounding is the cause of most crime
- V_5 = Divorce is the cause of most crime
- V_6 = Parental neglect is the cause of most crime
- V_7 = School dropout is the cause of most crime
- V_8 = Peer pressure is the cause of most crime
- V_9 = Advancement in technology is the cause of most crime
- V_{10} = Insecurity is the cause of most crime
- V_{11} = Climatic condition is the most cause of crime
- V_{12} = The speed of urbanization is the cause of most crime
- V_{13} = Political democratization is the cause of most crime

From Table 2, it appears that close to 58% (32.4 + 25.5) % of the police and prison officers who responded to the questionnaire have being in the service for at most 20 years. This implies that quite a number of the officers have the needed experience in the field so as to express views concerning crime in the Municipality.

Table 2. Distribution of officers by years of experience

	Frequency	Percent
Below 10 years	41	40.1
11-20 years	33	32.4
21-30 years	26	25.5
Above 30 years	2	2.0
Total	102	100.0

Source: Field Survey, 2014

From Table 3, out of 102 questionnaires distributed, 87.25% of the respondents rated male as a gender that mostly engage in crime, 12.75% was non- response and female 0%. This indicates that males in the Municipality are the most people involving in crime.

It can be seen from Table 4 that, out of 102 questionnaires distributed, 44.1% were recorded for 16 - 25 years and 32.4% for 26 - 35 years group. It is worth mentioning that, the age group of 16 - 35 years is the target population that mostly involved in crime in the Municipality.

Table 3. Gender that mostly involve in crime

	Frequency	Percent
Male	89	87.25
Non-response	13	12.75
Total	102	100.0

Source: Field Survey, 2014

Table 4. Age group that mostly involve in crime

	Frequency	Percent
15 years	3	2.9
16-25 years	45	44.1
26-35 years	33	32.3
Non-response	21	20.6
Total	102	100.0

Source: Field Survey, 2014

From Table 5 below, certain indicator variables appear to have greater mean values than the others. This means majority of the people attached greater importance to those variables and rated them highly. It could be seen from the table that "poverty is a cause of most crime" has the greatest mean value of 4.12, followed by "parental neglect" which has a mean value of 4.08, "unemployment, a mean value 3.94, followed by "drug abuse" a mean of 3.91, followed by "peer pressure" 3.65, followed by "school drop- out" 3.54, followed by "social surroundings" 3.44, and "climatic conditions" with a mean of 3.16. In all eight variables have been rated high by the respondents.

Table 5. Descriptive statistics of indicators

Variables	Mean	Std. deviation
V ₁	4.12	0.832
V ₂	3.91	0.845
V ₃	3.94	0.932
V ₄	3.44	1.041
V ₅	2.86	0.990
V ₆	4.08	0.808
V ₇	3.54	0.954
V ₈	3.65	0.713
V ₉	2.30	0.770
V ₁₀	2.68	0.938
V ₁₁	3.16	4.967
V ₁₂	2.45	0.825
V ₁₃	1.92	0.938

Source: Field Survey, 2014

Also it was observed from table 5 that, "transition towards political democratization" has a relatively small mean of 1.92 and "advancement in technology" and "the speed of urbanization" has a mean of 2.30 and 2.45 respectively. Follow by "insecurity" 2.68, and "divorce" with a mean of 2.86. This means that most people do not attached much importance to these variables and therefore rated them very low as a cause of crime and must therefore considered for scrutiny. The second smallest standard deviation value "advancement in technology" and has the second lowest mean value must not go unnoticed. This means that most of the values attributed to that variable are not far from their mean 2.30.

It's also worth mentioning that some of the indicator variables in Table 5 also have relatively small mean and larger standard deviation values.

4.1 Correlation Analysis

Correlation matrix is the lower triangle matrix showing the simple correlation between all possible pairs of variables included in the analysis. Before the data is subjected to factor analysis in order to identify salient factors, we conduct first a correlation analysis of the data. It tells the simple correlation that exists between the original indicator variables. Variables with high correlation among themselves are identified and grouped, giving us a clue as to the number of labels to expect before the data is subjected to further analysis.

From Table 6 the highest correlation of 0.39 is observed between “insecurity is a cause of crime” and “transition towards political democratization”. The second highest of 0.34 is observed between “Divorce” and “parental neglect as a cause of crime”. Also another higher correlation of 0.28 is observed between “parental neglect” and school drop-out”, and also between “advancement in technology” and “the speed of urbanization” respectively. Furthermore, a correlation of 0.27 was observed between “social surroundings” and “advancement in technology”. However other correlation were seen between the following variable, “drug abuse is a cause of most crime” and “peer pressure”, 0.24, “poverty” and “parental neglect “has a correlation of 0.25 .it is therefore apparent that the following groupings have high correlation among them. The groupings are denoted by;

- $X_1 = \{ \text{insecurity is a cause of crime, transition towards political democratization} \}$
- $X_2 = \{ \text{divorce, parental neglect and school dropout is a cause of crime} \}$
- $X_3 = \{ \text{advancement in technology and the speed of urbanization} \}$
- $X_4 = \{ \text{social surroundings, peer pressure and advancement in technology} \}$
- $X_5 = \{ \text{poverty and parental neglect is a cause of most crime} \}$

We relished that, the correlation among these variables appear greater than those of the other variables. These give a clue that, those variables form a homogeneous grouping among themselves. This implies that the correlation matrix suggest a suitable positive correlation for a number of underlying factors that explained the correlation among the variables. These further suggest that there are five main factors that cause crime in the Ho Municipality. The lowest correlation of 0.00 was observed among V_1 and V_{10} (Poverty and Insecurity) and also among V_{12} and V_3 (Speed of Urbanization and Unemployment). Also a low correlation of 0.01 was observed among V_1 and V_9 (Poverty and Advancement in Technology).

Table 6. Correlation matrix

	V_1	V_2	V_3	V_4	V_5	V_6	V_7	V_8	V_9	V_{10}	V_{11}	V_{12}	V_{13}
V_1	1.0												
V_2	0.7	1.0											
V_3	0.01	-0.02	1.00										
V_4	0.01	0.15	0.09	1.00									
V_5	0.16	0.08	-0.13	-0.00	1.00								
V_6	0.25	0.16	0.21	0.34	0.17	1.00							
V_7	-0.15	0.15	0.05	0.10	0.19	0.28	1.00						
V_8	-0.08	0.24	-0.11	0.07	-0.09	-0.13	0.17	1.00					
V_9	0.10	0.10	-0.15	-0.10	0.27	0.00	-0.12	0.22	1.00				
V_{10}	0.00	-0.07	0.18	0.17	-0.17	0.08	-0.07	0.11	-0.02	1.00			
V_{11}	0.16	0.12	0.03	0.14	0.03	0.13	-0.09	-0.02	-0.04	0.02	1.00		
V_{12}	-0.05	0.20	0.00	-0.02	0.12	-0.09	-0.04	0.08	0.28	0.16	0.14	1.00	
V_{13}	-0.13	-0.33	0.10	-0.03	0.03	-0.26	-0.42	0.15	0.24	0.39	-0.02	0.13	1.00

Source: Field Survey, 2014

It is also worth mentioning that a negative correlation was observed among some variables. The negative correlation indicates that as one respondent attached more importance to a particular variable by rating them high, they turn to pay little or no attention to the other variables.

4.2 Further Analysis

Here we want to perform further analysis on those factors so as to assigned labels to them. In order to attain this task, the data is been scrutinized through other process of factor analysis.

In order to determine the appropriateness of factor analysis, we have to observe the value of the Bartlett’s test of sphericity and the Kaiser-Meyer – Olkin (KMO) values using the SPSS output.

From the Table 7, the Kaiser-Meyer - Olkin Measure (KMO) value of 0.5, we realized that the test is not possible therefore not adequate for factoring. Although the Bartlett’s test of sphericity is also highly significant (a p-value of 0.000) at a large chi-square value of 166.1 this values been large enough does not warrant the factor analysis hence non parametric (Binomial test) analysis is appropriate. The binomial test was categorized into two phases, in phase one we have (Disagree, Strongly Disagree and Maybe), denoting group one thus DISAGREE and in phase two we have (Agree and Strongly agree), denoting group two thus AGREE.

Table 7. KMO and Bartlett’s test

Measure	Value
KMO measure of sampling adequacy	0.5
Bartlett's test critical value	166.1
Bartlett's test degree of freedom	78.0
Bartlett's significant value	0.0

Source: Field Survey, 2014

From the Table 8, it can be seen that, the significant values of all the variables are less than 0.5. This means, there is a significant differences between the proportions of those who agree or strongly agree and the other group, with those who disagree or strongly disagree and uncertain between the two categories for the 13 variables.

From the Binomial test in table 8 below, respondents significantly agree with V_1 (poverty is the cause of most crime), V_2 (drug abuse is the cause of most crime), V_3 (unemployment is the cause of most crime), V_6 (parental neglect is the cause of most crime) and V_8 (peer pressure is the cause of most crime). They also, significantly disagree with V_5 (Divorce is the cause of most crime), V_9 (Advancement in technology is the cause of most crime), V_{10} (Insecurity is the cause of most crime), V_{11} (climatic condition is the cause of most crime), V_{12} (speed of urbanization is the cause of most crime) and V_{13} (transition towards political democratization is the cause of most crime).

Meanwhile, they neither disagree nor agree with V_4 (Social surrounding is the cause of most crime) and V_7 (School dropout is the cause of most crime).

It is therefore worth mentioning that, poverty, unemployment, parental neglect, peer pressure and drug abuse are the major causes of crime in Ho Municipality.

Analysis was carried out on the secondary data collected from Regional crime unit of the Volta regional command of the Ghana police service and the prison service.

Fig. 1 below shows that, assault and stealing recorded high crime rate whiles attempted murder, abduction, rape, dangerous drug forgery and counterfeiting recorded low crime rate.

The time series plot in Fig. 2 below has shown that there exists an increasing trend with some seasonal effects occurring within a year. The plot also shows that higher crimes were recorded mostly in the first and fourth quarters.

Table 8. Binomial test on the causes of crime

		Category	N	Observed Prop.	Test Prop.	Asymp. Sig. (2-tailed)
V ₁	Group 1	Disagree	23	0.23	0.50	.000(a)
	Group 2	Agree	79	0.77		
	Total		102	1.00		
V ₂	Group 1	Disagree	28	0.27	0.50	.000(a)
	Group 2	Agree	74	0.73		
	Total		102	1.00		
V ₃	Group 1	Disagree	27	0.26	0.50	.000(a)
	Group 2	Agree	75	0.74		
	Total		102	1.00		
V ₄	Group 1	Disagree	62	0.61	0.50	.037(a)
	Group 2	Agree	40	0.39		
	Total		102	1.00		
V ₅	Group 1	Disagree	76	0.75	0.50	.000(a)
	Group 2	Agree	26	0.25		
	Total		102	1.00		
V ₆	Group 1	Disagree	20	0.20	0.50	.000(a)
	Group 2	Agree	82	0.80		
	Total		102	1.00		
V ₇	Group 1	Disagree	35	0.35	0.50	.003(a)
	Group 2	Agree	66	0.65		
	Total		101	1.00		
V ₈	Group 1	Disagree	32	0.31	0.50	.000(a)
	Group 2	Agree	70	0.69		
	Total		102	1.00		
V ₉	Group 1	Disagree	92	0.92	0.50	.000(a)
	Group 2	Agree	8	0.08		
	Total		100	1.00		
V ₁₀	Group 1	Disagree	69	0.71	0.50	.000(a)
	Group 2	Agree	28	0.29		
	Total		97	1.00		
V ₁₁	Group 1	Disagree	89	0.90	0.50	.000(a)
	Group 2	Agree	10	0.10		
	Total		99	1.00		
V ₁₂	Group 1	Disagree	89	0.93	0.50	.000(a)
	Group 2	Agree	7	0.07		
	Total		96	1.00		
V ₁₃	Group 1	Disagree	87	0.91	0.50	.000(a)
	Group 2	Agree	9	0.09		
	Total		96	1.00		

Source: Field Survey, 2014

The regression analysis from Table 9 appears to be good enough, since the significant value, 0.00, is statistically significant. This implies that fitting a model between the two variables, time (year) and number of crimes would be valid. The regression model between the two variables would be fit 70% of all times. The model is $\hat{y}_c = \beta_0 + \beta_1 t$, where β_0 and β_1 are the regression coefficients and t is year been expressed in time. Hence, $\hat{y}_c = 131.72 + 9.53t$. Given any time, t, we can now forecast the crimes. But this would not be use in this state to predict crimes until the seasonal indexes are found and forecast values calculated.

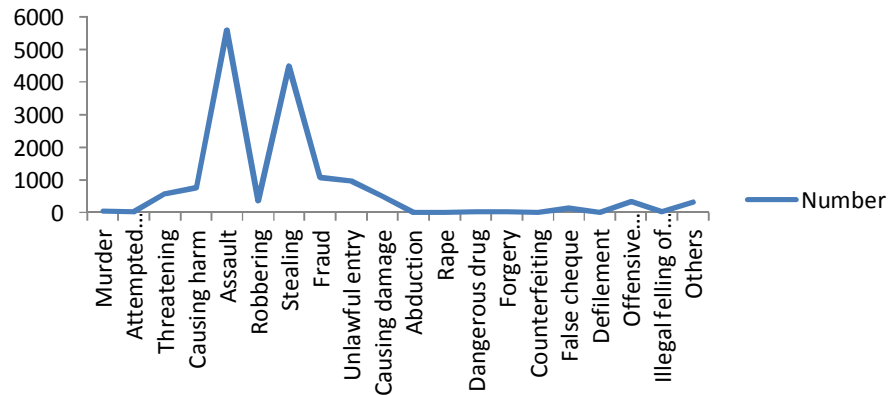


Fig. 1. Analysis on types of crime

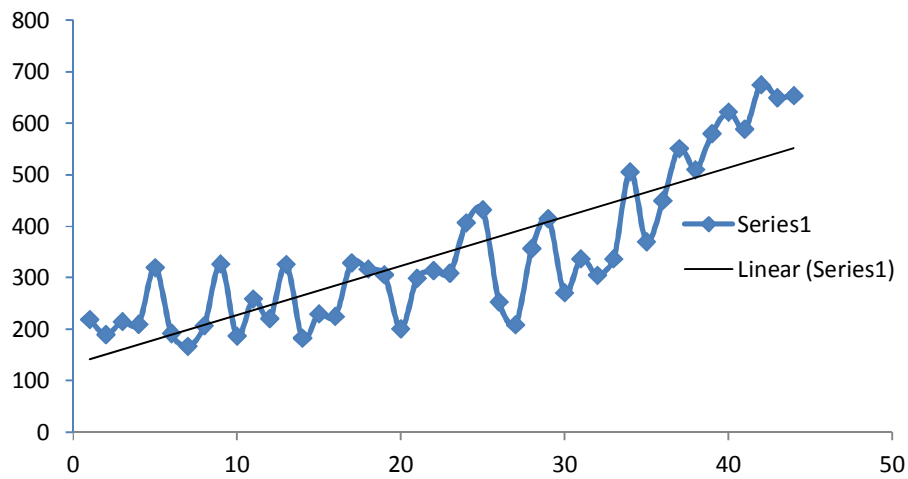


Fig. 2. Time series analysis on crime

Table 9. Regression statistics for time and crimes

Regression statistics					
Multiple R					0.83
R Square					0.70
Adjusted R Square					0.69
Standard Error					81.90
Observations					44
ANOVA					
	<i>Df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	644720.27	644720.3	96.12	0.00
Residual	42	281712.89	6707.45		
Total	43	926433.16			
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	
Intercept	131.72	25.12	5.24	0.00	
Time	9.53	0.97	9.80	0.00	

Table 10. Seasonal indexes

Year	Time, t	No. of Crimes, y_c	\hat{y}_c	Seasonal indexes, $\frac{y_c}{\hat{y}_c}$
2004	1	219	141.25	1.55
	2	190	150.78	1.26
	3	215	160.31	1.34
	4	210	169.84	1.24
2005	5	320	179.37	1.78
	6	192	188.9	1.02
	7	167	198.43	0.84
	8	207	207.96	1.00
2006	9	327	217.49	1.50
	10	187	227.02	0.82
	11	259	236.55	1.09
2007	12	221	246.08	0.90
	13	326	255.61	1.28
	14	183	265.14	0.69
	15	230	274.67	0.84
2008	16	225	284.2	0.79
	17	329	293.73	1.12
	18	317	303.26	1.05
2009	19	306	312.79	0.98
	20	201	322.32	0.62
	21	299	331.85	0.90
	22	314	341.38	0.92
2010	23	309	350.91	0.88
	24	407	360.44	1.13
	25	432	369.97	1.17
	26	253	379.5	0.67
2011	27	209	389.03	0.54
	28	357	398.56	0.90
	29	415	408.09	1.02
2012	30	271	417.62	0.65
	31	337	427.15	0.79
	32	305	436.68	0.70
	33	337	446.21	0.76
2013	34	506	455.74	1.11
	35	370	465.27	0.80
	36	450	474.8	0.95
	37	551	484.33	1.14
2014	38	510	493.86	1.03
	39	580	503.39	1.15
	40	622	512.92	1.21
2014	41	589	522.45	1.13
	42	675	531.98	1.27
	43	650	541.51	1.20
	44	654	551.04	1.19

The summary statistics from Table 11 below shows that crime rate have been on the increase in the Municipality over years. In general, the Municipality recorded higher crimes in 2012 to 2014 higher than annual average of 346.20. The quarterly index also suggests that number of crimes committed in the first quarter was above the annual average by 21% (121-100) %, crimes in the other quarters; second, third and fourth were 4% (100-96) % below, 5% (100-95) % below and 4% (100-96) % below respectively.

Table 11. Quarterly seasonal index and average crimes

	First quarter		Second quarter		Third quarter		Fourth quarter				
Index	1.21		0.96		0.95		0.96				
Yearly average											
Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Crimes	208.5	221.5	248.5	241	288.25	332.25	312.75	332	415.75	565.75	642
Annual average											
Crimes	346.20										

4.3 Forecasting With Seasonal Indexes

If the time series is composed of seasonal variation and long-term trend, we can use the seasonal indexes and the regression equation to forecast. The forecast for time period t is calculated as;

$$F_t = [\beta_o + \beta_1 t] \times SI_t$$

Where, F_t = Forecast for period t

$\beta_o + \beta_1 t$ = Regression equation

SI_t = Seasonal index for period t

The results are displayed in table 12 below

Table 12. Forecast for 2015 to 2020 crimes

Year	Quarter	Time	\hat{y}	Seasonal index, SI	Forecast, $\hat{y} \times SI$
2015	1	45	560.57	1.21	678
	2	46	570.10	0.96	547
	3	47	579.63	0.95	551
	4	48	589.16	0.96	566
2016	1	49	598.69	1.21	724
	2	50	608.22	0.96	584
	3	51	617.75	0.95	587
	4	52	627.28	0.96	602
2017	1	53	636.81	1.21	771
	2	54	646.34	0.96	620
	3	55	655.87	0.95	623
	4	56	665.40	0.96	639
2018	1	57	674.93	1.21	817
	2	58	684.46	0.96	657
	3	59	693.99	0.95	659
	4	60	703.52	0.96	675
2019	1	61	713.05	1.21	863
	2	62	722.58	0.96	694
	3	63	732.11	0.95	696
	4	64	741.64	0.96	712
2020	1	65	751.17	1.21	909
	2	66	760.70	0.96	730
	3	67	770.23	0.95	732
	4	68	779.76	0.96	749

Fig. 3 below shows the forecast trend of crimes from 2015 to 2020, which is indicating an increase in crime rate.

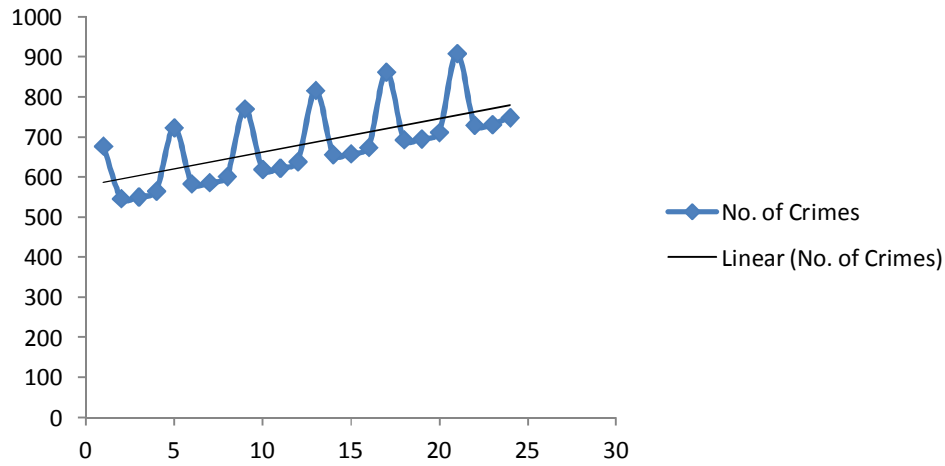


Fig. 3. Time series graph on the forecast crimes

5 Conclusion

Base on the literature reviewed, as well as the discussions made from the analyzes, it is desirable to draw the following conclusions;

1. Crime is on the increase and therefore needs to be paid much attention.
2. Poverty, parental neglect, drug abuse, peer pressure and unemployment are the major causes of crime in the Municipality.
3. Males are the people highly engaged in crime in the Municipality.
4. People in the age group ranging between 16-35 years are the people that mostly engaged in crime.

6 Recommendations

Based on the conclusions the following recommendations are made; Seminars and other educational talks should be held frequently by the National Commission for Civic Education (NCCE) and other co-operate organizations particularly in our schools and churches must create the awareness on drug abuse and its effects. We propose an alternative strategy to control crime by enhancing police efficiency, which is by introducing volunteer reinforcement either by enlarging its size or by updating its technology. Parents must also be educated on the effects of child neglect and Finally Government and other co-operate bodies must join hands together in finding lasting solution to youth unemployment in the country.

Competing Interests

Authors have declared that no competing interests exist.

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