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STATISTICAL ANALYSIS OF THE PREVALENCE OF DRUG ABUSE IN ANINRI L.G.A. OF ENUGU STATE FROM 2006 TO 2015

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Abstract
The study involved using statistical tools to analyse the prevalence of drug abuse in Aninri Local Government Area in Enugu State Nigeria (from 2006 – 2015). The particular interest is in the three highly abused drugs/ substances namely; cannabis sativa, heroin and cocaine. The data used were gotten from the security department of the National Drug Law Enforcement Agency (NDLEA).The statistical techniques used in analysing the data were chi-sqaure and time series, to achieve the objective of the study. The result shows that makes abuse drugs more than females; it also shows that cannabis sativa is the most frequently abused substance by people of ages 21 – 25. The study shows that drug abuse in independent on sex and age of the abusers. This was needful in making forecast for next two years.
Keywords: drug abuse, cannabis sativa, heroine, cocaine, seasonal variation

1.1 Introduction

According to World Health Organisation (WHO), drug abuse refers to harmful or hazardous use of psychoactive substances including alcohol and illicit drugs. Drug abuse is a patterned use of a drug in which the user consumes the substance in amounts or with methods which are harmful to themselves or others (Wikipedia). Drug abuse can also be understood as the use of a drug (narcotics, alcohol, cocaine etc) without medical justification/ prescription. Drug abuse has become another global issue because of its effects and alarming increase rate. Nigeria is not an exception, having a population with predominantly youths within the ages of 18 and 40. The social effects of drug abuse which

include criminal offences, road accidents, loss of jobs, moral decadence etc are of great concern to the government. The abuse of various moods – altering substances has been reported to be prevalent among Nigerian Youths. Some substances alter the mind; change the user's feeling, perception and behaviour when they are used because they exert action on the brain. Global studies on drug abuse revealed that early initiation of drug use is one of the best predictors of future drug abuse and dependence. For instance, youths whose drug use started before the age of 14 are more vulnerable to drug problems later in life than those who started using drugs at the age of 21 and above. The use of drugs has always been an inseparable part of occultism and the youths in Nigeria's tertiary institutions are deeply involved in this practice. Studies show that drug abuse can be caused by reasons among which is peer group pressure occasioned by the desire to belong and be accepted, ignorance, psychological, and emotional stress in forms of depression, stress, anxiety, low self esteem etc. It can also be caused by desperation, attempt to heighten one's performance (athletes or artistes), social pathologies like economic frustration, unemployment etc.

Because of the damaging effects of drug abuse, countries, like Nigeria, have come up with various stringent laws and punitive measures aimed at curbing the menace. However, these laws and measures have not been adequate in eradicating the malady.

Echika (2015), "The rising scourge of hard drug consumption and trafficking has affected the health and economy of this nation. It has become a menace, which deserves ruthless action to check.

Sijuwola (2012), described the use of hard drugs as a "great threat to our social being". Sijuwola said that the problem of abuse of drugs must be tracked from the root and this will require comprehensive enlightenment campaign directed at the young ones from the primary school level.

The study is aimed at finding out the prevalence of drugs use and abuse in Aninri Local Government Area in Enugu State, finding out whether these drugs use and abuse in the area depends on age and sex and using the result to predict future trends or abuse of drugs in the area. The study focuses on the prevalence of cocaine, heroin, and cannabis sativa in the area.

2.1 Methodology

For the research, secondary data was used. Data was collected from the security department of National Drug Law Enforcement Agency (NDLEA) in Aninri Local Government Area of Enugu State from (2006 – 2015).

Table 2.1: Distribution of Persons Arrested for Classified Drugs Offence (2006 – 2015)

Year	Cannabis Sativa	Heroine	Cocaine	Total
2006	17	2	3	22
2007	20	3	2	25
2008	25	2	1	28
2009	11	5	2	18
2010	35	7	2	44
2011	10	1	1	12
2012	19	4	2	25
2013	21	6	5	32
2014	8	2	2	12
2015	22	5	7	34
Total	**188**	**37**	**27**	**252**

Source: National Drug Law Enforcement Agency, Aninri L.G.A.

Table 2.2: Distribution of Persons Arrested According to Sex (2006 – 2015)

Year	Male	Female	Total
2006	21	6	27
2007	11	7	18
2008	20	6	26
2009	22	11	33
2010	22	6	28
2011	8	5	13
2012	12	7	19
2013	25	3	28
2014	18	4	22
2015	24	14	38
Total	**183**	**69**	**252**

Source: National Drug Law Enforcement Agency, Aninri L.G.A.

Table 2.3: Distribution of Persons Arrested For Classified Drug Offence by Age

Year	Cannabis Sativa	Heroine	Cocaine	Total
11 – 15	14	2	2	18
16 – 20	21	5	3	29
21 – 25	35	8	7	50
26 – 30	32	6	5	43
31 – 35	29	4	2	35
36 – 40	20	3	3	26
41 – 45	17	4	2	23
46 – 50	10	3	1	14
51 & above	10	2	2	14
Total	**188**	**37**	**27**	**252**

Source: National Drug Enforcement Agency, Aninri L.G.A

2.2 Percentage Distributions

2.2.1 Percentage of the Distribution of Persons Arrested for Classified Drug Offence (2006 – 2015)

Cannabis Sativa: $\frac{188}{252}\times 100$ = 75%

Heroine: $\frac{37}{252}\times 100$ = 14.7%

Cocaine: $\frac{27}{252}\times 100$ = 10.7%

2.2.2 Percentage of the Distribution of Persons Arrested According to Sex (2006 – 2015)

Male: $\frac{183}{252}\times 100$ = 72.6%

Female: $\frac{69}{252}\times 100$ = 27.4%

2.2.3: Percentage of the Distribution of Persons Arrested for Classified Drug Offence by Age

11 – 15: $\frac{18}{252}\times 100$ = 7.1%

16 – 20: $\frac{29}{252}\times 100$ = 11.5%

21 – 25: $\frac{50}{252}\times 100$ = 19.8%

26 – 30: $\frac{43}{252}\times 100$ = 17.1%

31 – 35: $\frac{35}{252}\times 100$ = 13.9%

36 – 40: $\frac{26}{252}\times 100$ = 10.3%

41 – 45: $\frac{23}{252}\times 100$ = 9.1%

46 – 50: $\frac{14}{252}\times 100$ = 5.6%

51 & above: $\frac{14}{252}\times 100$ = 5.6%

3. Discussion and Analysis

3.1 Finding out Whether Drug Abuse in Aninri L.G.A Depends on Sex`

The relevant hypothesis will be tested at 5% level of significance (i.e. $\alpha = 0.05$ level).

Hypothesis

H_0: Drug abuse is independent on the sex of the drug abuser.

H_1: Drug abuse is dependent on the sex of the drug abuser.

Test Statistic

$$X^2_{cal} = \frac{\sum (O_{ij} - e_{ij})^2}{e_{ij}}$$

Where X^2 = chi-square

O_{ij} = observed frequency

e_{ij} = expected frequency

The expected frequencies were calculated using:

$$X_{ij} = \frac{X_i X_j}{n}$$

Where X_i = frequency total for row i

X_j = frequency total for column j

n = total (overall total)

Table 3.1 Test Statistic Values

Year	Male	Female	Total
2006	21 (19.60	6 (7.4)	27
2007	11 (13.1)	7 (4.9)	18
2008	20 (18.9)	6 (7.1)	26
2009	22 (24.0)	11 (9.0)	33
2010	22 (20.3)	6 (7.7)	28
2011	8 (9.4)	5 (3.6)	13
2012	12 (13.8)	7 (5.2)	19
2013	25 (20.3)	3 (7.7)	28
2014	18 (16.0)	4 (6.0)	22
2015	24 (27.6)	14 (10.4)	38
Total	**183**	**69**	**252**

Decision and Conclusion using Appendix A

Since $X^2_{cal} = 11.16 < X^2_{tab} = 17.0$, the null hypothesis is accepted against the alternative hypothesis. This means that drug abuse is independent of the sex of the drug abuser.

3.2 Finding out Whether Drug Abuse in Aninri Depends on the Age of the Abuser

The relevant hypothesis will be tested at 5% level of significance (i.e. $\alpha = 0.05$).

Hypothesis

H_0: Drug abuse is independent on the age of the drug abuser

H_1: Drug abuse is dependent on the age of the drug abuser.

Test Statistic

$$X^2_{cal} = \frac{\sum (O_{ij} - e_{ij})^2}{e_{ij}}$$

Decision and Conclusion using Appendix B

$X^2_{cal} = 3.32 < X^2_{tab}$ 26.3, we accept the null hypothesis and conclude that drug abuse is independent of the age of the drug abuser. Statistically, abuse of drugs does not depend on the age of the drug abuser.

3.3 Time Series Analysis using Least Square

Least square method is used in fitting trend line to a time series data. The linear trend equation is given as $y = a + bt$

Also the formulae for the parameter estimation are

$$b = \frac{n\sum ty - \sum t \sum y}{n\sum t^2 - (\sum t)^2}$$

$$a = \frac{\sum y}{n} - \frac{b\sum t}{n}$$

Table 3.2: Using Least Square Method to Obtain the Trend for Cannabis Sativa

	Yt	Ty	t^2	Trend Value
1	17	17	1	20.4364
2	20	40	4	20.0727
3	25	75	9	19.7091
4	11	44	16	19.3455
5	35	175	25	18.9818
6	10	60	36	28.6182
7	19	133	49	18.2545
8	21	168	64	17.8909
9	8	72	81	17.5273
10	22	220	100	17.1636
55	**188**	**1004**	**385**	**188**

$$b = \frac{n\sum ty - \sum t \sum y}{n\sum t^2 - (\sum t)^2} = \frac{10(1004) - 55(188)}{10(385) - (55)^2} = -0.363636$$

$$a = \frac{\sum y}{n} - \frac{b\sum t}{n} = \frac{188}{10} - \frac{(-0.363636)(55)}{10} = 20.80$$

Where the trend equation is given as

$$yt = a + bt$$

$$yt = 20.80 - 0.363636t$$

To obtain the trend value the substitute the value of t in the equation

2006, t = 1 → y(t) = 20.80 – 0.363636(1) = 20.4364

2007, t = 2 → y(t) = 20.28 – 0.363636(2) = 20.0727

2008, t = 3 → y(t) = 20.80 – 0.363636(3) = 19.1791

:

:

2015, t = 10 → yt = 20.80 – 0.363636(10) = 17.1636

Estimation of Seasonal Variation

There are different methods for computing seasonal indexes, but the multiplication model will be used in the work. The formula is

$$S.V = \frac{Actual\ Value\ \ (yt)}{Trend\ Value\ \ (trend)} \times 100$$

Table 3.3: Values for Seasonal Variation

Actual	Trend Value	Seasonal Variation (S.V)
17	20.4304	83.1849
20	20.0727	99.6378
25	19.7091	126.8450
11	19.3455	56.8608
35	18.9818	184.3871
10	18.6182	53.7109
19	18.2545	104.0839
21	17.8909	117.3781
8	17.5273	45.6431
22	17.1636	128.1782
Total = 188	**188**	**999.9098**

SEASONAL INDEX

Taking the average of the seasonal variation gives the seasonal index

$$S.I = \frac{999.9098}{10} = \frac{99.9098}{100} = 0.99991$$

Forecast

To obtain the forecast for 2 years, the value for t in the equation is

For 2016, t = 11 → y(t) = 20.80 – 0.363636(11) = 16.80

For 2017, t = 12 → y(t) = 20.80 – 0.363636(12) = 16.44

Table 3.3.1: Forecast

T	yt	Seasonal Index	Forecast
11	16.80	0.99991	16.7985
12	16.44	0.99991	16.4385

Table 3.4 Using Least Square Method to Obtain the Trend for Heroine

Time (t)	Yt	Ty	t^2	Trend Value
1	2	2	1	2.858
2	3	6	4	3.046
3	2	6	9	3.234
4	5	20	16	3.422
5	7	35	25	3.610
6	1	6	36	3.798
7	4	28	49	3.986
8	6	48	64	4.174
9	2	18	81	4.362
10	5	50	100	4.550
Total =55	**37**	**219**	**385**	**37.04**

$$b = \frac{n\sum ty - \sum t \sum y}{n\sum t^2 - (\sum t)^2} = \frac{10(219) - 55(37)}{10(385) - (55)^2} = \frac{2190 - 2035}{3850 - 3025} = \frac{155}{825} = 0.188$$

$$a = \frac{\sum y}{n} - \frac{b\sum t}{n} = \frac{37}{10} - \frac{(0.188)(55)}{10} = 3.7 - 1.034 = 2.67$$

Therefore $Yt = 2.67 + 0.188t$

To obtain the trend value, we substitute the value of t in the equation;

2006, t = 1 → y(t) = 2.67 + 0.188(1) = 2.858

2007, t = 2 → y(t) = 2.67 + 0.188(2) = 3.046

2015, t = 10 → y(t) = 2.67 + 0.188(10) = 4.550

Table 3.4.1: Seasonal Variation Values for Heroine

Actual	Trend Value	Seasonal Variation
2	2.858	69.9790
3	3.046	98.4898
2	3.234	61.8429
5	3.422	146.1134
7	3.610	193.9058
1	3.798	26.3296
4	3.986	100.3512
6	4.174	143.7470
2	4.362	45.8505
5	4.550	109.8901
Total = 37	**37**	**996.4993**

$$S.V = \frac{Actual\ Value}{Trend\ Value} \times \frac{100}{1}$$

Seasonal Index

Taking the average of the seasonal variation gives the seasonal index

$$S.I = \frac{996.4993}{10} = \frac{99.64993}{100} = 0.9965$$

Forecasting:

To obtain the forecast value for two(2) years, we have ;

For 2016, t = 11 → y(t) = 2.67 + 0.188(11) = 4.738

For 2017, t = 12 → y(t) = 2.67 + 0.188(12) = 4.926

Forecast Table

T	Yt	Seasonal Index	Forecast
11	4.738	0.9965	4.7214
12	4.926	0.9965	4.9088

Table 3.5.1: Using Least Square to Obtain the Trend for Cocaine

Time (t)	Yt	Ty	T^2	Trend Value
1	3	3	1	1.215
2	2	4	4	1.545
3	1	3	9	1.875
4	2	8	10	2.205
5	2	10	25	2.535
6	1	6	36	2.865
7	2	14	49	3.195
8	5	40	64	3.525
9	2	18	81	3.855
10	7	70	100	4.185
Total = 55	**27**	**176**	**385**	**27**

$$b = \frac{n\sum ty - \sum t \sum y}{n\sum t^2 - (\sum t)^2} = \frac{10(176) - 55(27)}{10(385) - (55)^2} = 0.33$$

$$a = \frac{\sum y}{n} - \frac{b\sum t}{n} = \frac{27}{10} - \frac{0.33(55)}{10} = 0.885$$

$$yt = a + bt$$

$$yt = 0.885 + 0.33t$$

We substitute for *t* to get the trend values;

For 2006, t = 1 → y(t) = 0.885 + 0.33(1) = 1.215

For 2007, t = 2 → y(t) = 0.885 + 0.33(2) = 1.545

For 2015, t = 10 → y(t) = 0.885 + 0.33(10) = 4.185

Seasonal Variation

$$S.V = \frac{Actual\ Value\ (yt)}{Trend\ Value} \times 100$$

Table 3.5.2: Seasonal Variation Values for Cocaine

Actual	Trend Value	Seasonal Variation
3	1.215	246.9136
2	1.545	129.4498
1	1.875	53.3333
2	2.205	90.7029
2	2.535	78.8955
1	2.865	34.9040
2	3.195	62.5978
5	3.525	141.8440
2	3.855	51.8807
7	4.185	167.2640
Total = 37	**27**	**1057.77856**

Seasonal Index

$$S.I = \frac{1057.77856}{10} = \frac{105.778}{100} = 1.0578$$

Forecasting

For 2 years: 2016, t = 11 → y(t) = 0.885 + 0.33(11) = 4.515

2017, t = 12 → y(t) = 0.885 + 0.33(12) = 4.895

Forecast Table

T	Yt	Seasonal Index	Forecast
11	4.515	1.0578	4.776
12	4.845	1.0578	5.125

4. Conclusion and Recommendation

From the study, drug abuse is not the same over the years. 2010 recorded the highest abuse incidence with forty four (44) people arrested for different drug related offences while 2011 and 2014 had the least. The study also shows that males abuse drug more than females and that cannabis sativa has the highest drug abuse rate. From the study the ages 21 – 25, recorded the highest drug abuse cases. This shows that youth within this age bracket are more involved in abusing drugs.

From the time series analysis, the trend value for each year decreased for cannabis sativa, for heroine and cocaine, it increased.

Following the results, the following recommendations are made;

- There should be sensitization programmes on effects of drug abuse on individuals and societies in Aninri L.G.A.
- The National Drug Law Enforcement Agency in Aninri should increase its prosecution of offenders without bias.
- Youths should be exposed to job opportunities to engage their minds in legitimate activities.

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APPENDIX A

By using the table, we have

$$X^2_{cal} = \frac{(21-19.6)^2}{19.6} + \frac{(11-13.1)^2}{13.1} + \frac{(20-18.9)^2}{18.9} + \frac{(22-24.0)^2}{24.0} + \frac{(22-20.3)^2}{20.3} + \frac{(8-9.4)^2}{9.4} + \frac{(12-13.8)^2}{13.8}$$
$$+ \frac{(25-20.3)^2}{20.3} + \frac{(18-16.0)^2}{16.0} + \frac{(24-27.6)^2}{27.6} + \frac{(6-7.4)^2}{7.4} + \frac{(7-4.9)^2}{4.9} + \frac{(6-7.1)^2}{7.1} + \frac{(11-9,0)^2}{9.0} + \frac{(6-7.7)^2}{7.7}$$
$$+ \frac{(5-3.6)^2}{3.6} + \ldots$$

$$X^2_{cal} = 0.1+0.34+0.06+0.17+0.14+0.21+0.23+1.09+0.25+0.47+0.26+0.9+0.17+0.44+\ldots = 11.16$$

In this case, the degree of freedom is given as

$$(r-1)(c-1) = (10-1)(2-1) = 9\times 1 = 9$$

$X^2_{tab} = X^2_{0.05} 9 = 17.0$

APPENDIX B

The expected frequencies are in brackets.

Table 3.6

Year	Cannabis Sativa	Heroine	Cocaine	Total
11 – 15	14(13.4)	2(2.6)	2(1.9)	18
16 – 20	21(11.6)	5(4.3)	3(3.1)	29
21 – 25	35(37.3)	8(7.3)	7(5.4)	50
26 – 30	32(32.1)	6(6.3)	5(4.6)	43
31 – 35	29(26.1)	4(5.1)	2(3.8)	35
36 – 40	20(19.4)	3(3.8)	3(2.8)	26
41 – 45	17(17.2)	4(3.4)	2(2.5)	23
46 – 50	10(10.4)	3(2.1)	1(1.5)	14
51 +	10(10.4)	2(2.1)	2(1.5)	14
Total	**188**	**37**	**27**	**252**

By using the above values in the above, we have;

$$X^2_{cal} = \frac{(14-13.4)^2}{13.4} + \frac{(21-21.6)^2}{21.6} + \frac{(35-37.3)^2}{37.3} + \frac{(32-32.1)^2}{32.1} + \frac{(29-26.1)^2}{26.1} + \frac{(20-19.4)^2}{19.4} + \frac{(17-17.2)^2}{17.2}$$
$$+ \frac{(10-10.4)^2}{10.4} + \frac{(10-10.4)^2}{10.4} + \frac{(10-10.4)^2}{10.4} + \frac{(2-2.6)^2}{2.6} + \ldots + \frac{(2-1.5)^2}{1.5} = 3.32$$

Degree of freedom:

$$(c-1)(r-1) = (3-1)(9-1) = 16$$

$X^2_{0.05}$, $16 = 26.3$

Trend Analysis for CANNABIS

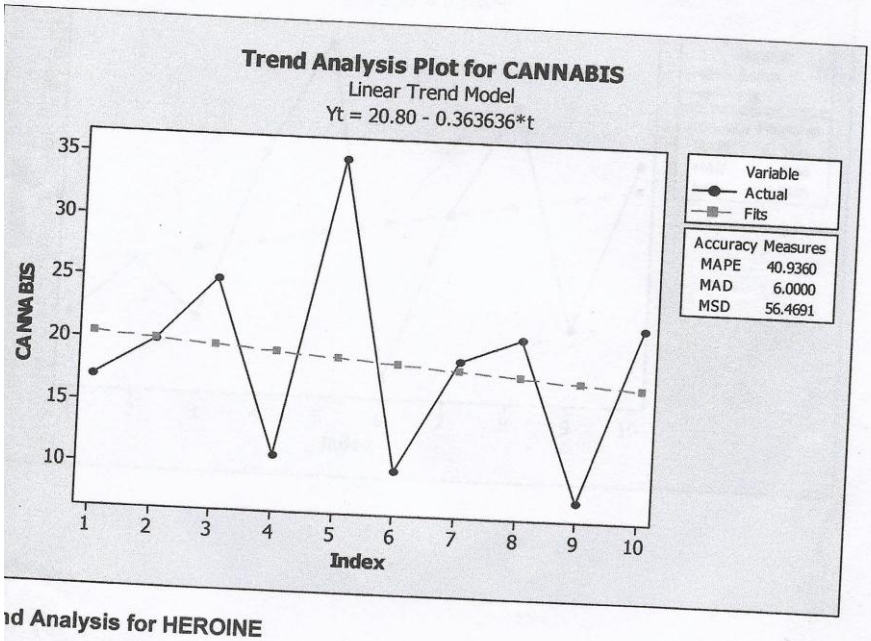
```
Data        CANNABIS
Length      10
NMissing    0

Fitted Trend Equation

Yt = 20.80 - 0.363636*t

Accuracy Measures

MAPE   40.9360
MAD     6.0000
MSD    56.4691
```

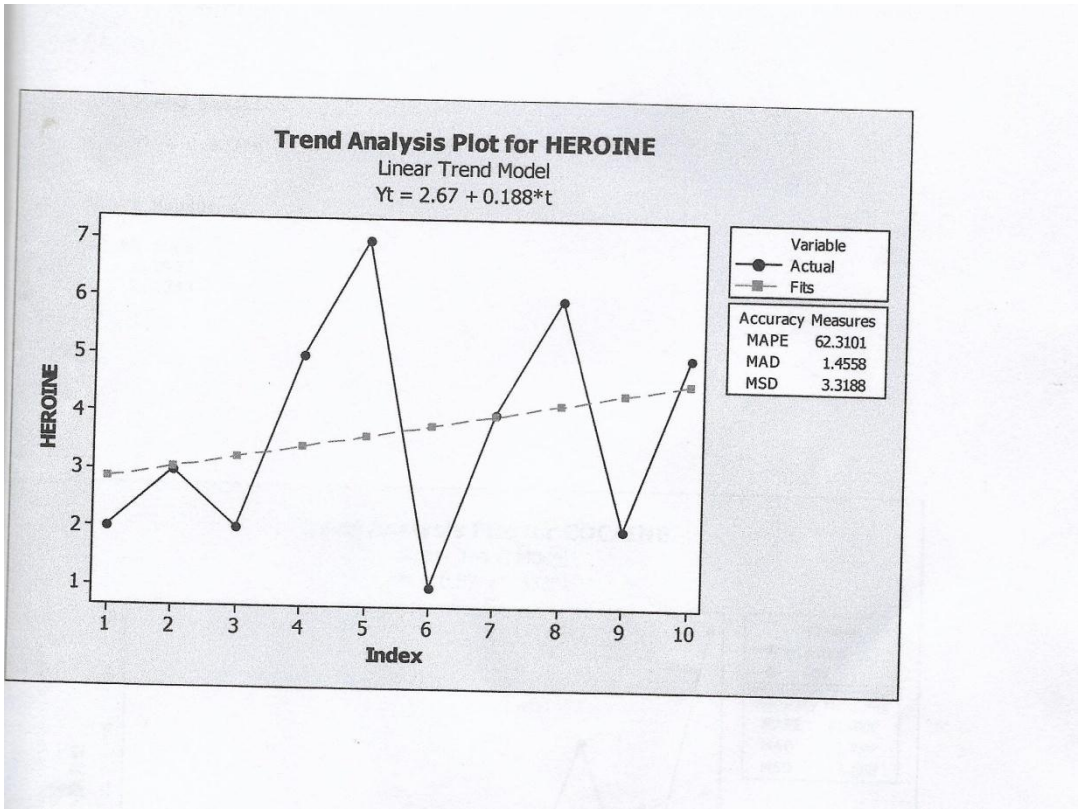


nd Analysis for HEROINE

```
          HEROINE
th        10
sing      0

ed Trend Equation

2.67 + 0.188*t
```


Trend Analysis Plot for HEROINE
Linear Trend Model
Yt = 2.67 + 0.188*t
HEROINE
Index
Variable
Actual
Fits
Accuracy Measures
MAPE 62.3101
MAD 1.4558
MSD 3.3188

Trend Analysis for COCAINE

```
Data       COCAINE
Length     10
NMissing   0

Fitted Trend Equation

Yt = 0.87 + 0.333*t

Accuracy Measures

MAPE   61.6000
MAD     1.3067
MSD     2.2933
```