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Factors Influencing the use and Abuse of Drugs by Commercial Drivers: A Case of Commercial Drivers in Ghana

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Methodology: We developed and introduced a self administered questionnaire using a sample of 300 questionnaires. These were administered and carefully edited to ensure some level of consistency, clarity and reliability in the information gathered. Purposive sampling approach was used in the selection of commercial bus stations and cargo stations of selected regions depending on the locations of these stations and the population of vehicles. Backward elimination regression model-building technique was used in the selection of significant variable(s) into a fitted logistic regression model. Five percent statistical level of significance was required for a variable to stay in the model.

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Results: Commercial bus drivers who responded or participated in this study were male adults within the active age and fourty one percent were illiterate. About, thirty four percent of these commercial drivers admitted to using drug when driving and seventy percent of these drivers learned how to drive from unapproved driving institutions. Educational levels of these drivers, hours used to drive, how the commercial drivers were trained and distance they traveled were the most significant variables associated with the use of drug by commercial drivers.

Conclusion: In conclusion, there exists significant association between Levels of educational, distance traveled, time used in driving and drug Use by these commercial drivers. Drunk driving is a major threat to the development of Ghana. This threaten our transportation industry and measures ought to be taking to address this problem.

Keywords: drunk driving, substance abuse, marijuana, odds ratio, accidents.

I. Introduction

A drug can be defined as any chemical which is taken in order to treat or prevent an illness or disease. But these substances are mostly abuse as a result of their pleasant effects or reactions in the human system. Drug driving is the action or offense of driving a motor vehicle while under the influence of drugs, especially those that are illegal. Substance use and abuse by commercial drivers when driving should be of concern to both users and the general public.

According to a report by the Ghana National Road Safety Commission in 2012, substance use (Drug) among commercial drivers is one of the most serious challenges confronting the transportation industry in Ghana. The report indicated that, thirteen thousand, five hundred and twelve (13535) crashes have been recorded resulting over two thousand and sixty nine (2069) deaths.

a) Road accidents related to alcohol abuse

Significant number of road accidents can be attributed to drug use and drunk driving globally. The increase in the number of road traffic accidents in a report by the Ghana National Road Safety Commission, calls for a review of drunk driving in the country. The study was conducted to determine the types and use of drugs by drivers in Ghana. This will determine the social and cultural factors that influencedrug driving.

Significant number of road accidents can be attributed to drug use and drunk driving globally. Statistically, different patterns of usage are seen between population subgroups based on age, ethnicity, education, and marital status. This study is to compare whether or not those prevailing conditions are similar to commercial drivers in Ghana. In December, 2012, approximately 246 people died and about 1260 were injured in car accidents. According to the Commission, the major cause of road accidents in Ghana is due to over speeding. This accounts for 60 percent of car crashes in the country. This rising figures calls for review of the causes of these accidents.

[1] conducted a study to evaluate the use of alcohol and marijuana in Pakistan among commercial drivers. Ten percent of truck drivers used alcohol and thirty four percent used marijuana while driving on Pakistani roads.

In a research conducted by [2] on the prevalence of alcohol in injured Swedish drivers, the result indicated that 38 percent of the fatally injured drivers tested positive to alcohol.

Globally, significant proportion of road traffic accidents can be attributed to the use and abuse of

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alcohol and marijuana while driving. A study that was con- ducted by [3] to determine the use of alcohol and marijuana in Pakistan commercial drivers. A sample of bus and truck drivers were interviewed at the largest commercial vehicle terminals.

Statistically, different patterns of usage are seen between population subgroups based on age, ethnicity, education, and marital status [4]. This study is to com- pare whether or not those prevailing conditions are similar to commercial drivers in Ghana. According to the Ghana Road Safety Commission, the major cause of road accidents in Ghana is due to over speeding. This accounts for 60 percent of car crashes in the country. This rising figures calls for review of the causes of these accidents.

In a research conducted by [5, 6] on the prevalence of alcohol in injured Swedish drivers, the result indicated that 38 percent of the fatally injured drivers tested positive to alcohol. In a research conducted by [7] on several commercial drivers and their Blood Alcohol Concentration (BAC) to determined the association between BAC and road traffic accidents for these drivers. It was found that a relationship between BAC and the risk of becoming involved in a road traffic accident existed. Roadside studies conducted in the United States found that [8] 17 percent of the drivers had a Blood Alcohol Concentration (BAC) above the legal limit By comparing this figure to the European roadside studies [9], the percentage is a bit higher. Taking into account that the legal limit for driving in the United States of America can be higher than in Europe (0.08 percent versus 0.05 percent).

b) Road accidents related to Cannabis and Tobacco abuses

Smoking a cigarette can be regarded as a secondary task that may potentially distract from the primary driving task, or at least causes the driver to divide his attention between both activities when lighting up and extinguishing the cigarette [10]. Nicotine is known for its cognitive enhancing effects by reducing reaction time and increasing alertness. It can be hypothesized that smoking may actually improve driving performance. A few driving studies have focused on the effects of nicotine abstinence on driving performance [10]. A research conducted by [11] reported no difference in simulated driving performance between those who smoked a cigarette during the test and control subjects. Penning et al., (2010) however, indicated that when smokers had to refrain from smoking, they performed significantly worse. Surprisingly, a study conducted by [10] confirmed that driving performance of craving smokers significantly improved to normal (nonsmoker) levels after allowing them a cigarette.

Cannabis is to be the next most common drug of abuse found in drivers after alcohol [10]. A study from New Zealand reported that almost 21 percent of young drivers admitted that they had driven at least once after smoking cannabis [12]. Approximately 60 percent of the interviewed Australian nightclub attendees re- ported that they were driven home by someone under the influence of tetrahydro- cannabinol (THC) or that they drove themselves after smoking cannabis [13] Roadside studies by [10] indicated that 15 percent of drivers drive under the influence of one or more drugs of abuse. After drug use, drivers are more often culpable for an accident than non-users. Other drugs also implicated include benzodiazepines, cocaine, opiates, and amphetamines [14]. This study is to use a mathematical model to determine whether those conditions are the same in developing countries, especially Ghana.

A study of fatally injured drivers in Australia showed that when marijuana was present in the blood of the driver, he or she was much more likely to be at fault for the accident [15]. The matter of concern is not the rising figures nor the statistics of drug or alcohol use by commercial vehicle drivers but factors associated with the use of these chemical substances. This study is therefore to determine the social factors associated with substance by drivers as well as the commonest substances that are abuse by these drivers in Ghana [16].

c) Road accidents related to drugs and substance abuse

Generally, inhalants are commonly abused drugs by some commercial drivers in Ghana. The findings of [2] indicated that 0.1 percent of Spanish drivers admit- ted to have driven at least once after non medical use of inhalants. Moreover, researchers in Australia indicated that 5 percent interviewed drug users admitted ever driven under the influence of an inhalant Darke [17]. Investigations among US students indicated that 5.2 percent had abused inhalants before the ages of 18 years and approximately 62 percent of them had driven a car while under the influence of alcohol or drugs [18].

[18] examined the effects of inhalants on psycho-motor functioning. The result indicated that inhalants significantly impaired auditory reaction time, coordination and estimation. Moreover, memory function was also affected. Researchers also concluded that the subjects were much more tired after using isoflurane and sevoflurane.

[19] reported that inhalants are abused, they can cause hallucinations and distortions in perception as well. In addition, impaired muscle coordination and body balance may lead to road traffic accidents. [20] supported these findings and added, slurred speech, euphoria and decreased reflexes as commonly reported side effects.

[21] reported that 7 percent of fatally injured truck drivers had used metham-phetamines, when compared to 13 percent who had used cannabis or alcohol. However, some studies reported very high percentages of commercial drivers who use amphetamines. Methamphetamine use among commercial drivers is of great concern in respect of road traffic safety.

[22] investigated the effects of methamphetamine in narcoleptic patients and healthy subjects. Methamphetamine improved performance of narcoleptic patients in the driving simulator in a dose dependent manner.

[23] tested the effects of dexamphetamine, a drug with similar effects as metham-phetamine. This drug significantly impaired simulated driving performance during daytime testing. But night-time testing showed no significant differences from placebo were found. [24] reviewed literature on amphetamine and metham- phetamine and the findings are that low dosages of amphetamine significantly improve psychomotor performance of fatigued subjects. [25] came out with the conclusion that most studies that examined the behavioral effects of stimulant drugs report an increase in risk taking behaviuor and impaired decision making.

[25] concluded that both low and high dosages of methamphetamine may have an effect on driving performance.

Only few studies looked at the effects on driving of other drugs of abuse, such asketamine, inhalants and anabolic steroids, but suggest a negative effect on drivingperformance [10]

A number of studies have examined illicit drug use in drivers involved in mo-tor vehicle crashes, reckless driving, or fatal accidents. One study found that about34 percent of motor vehicle crash victims admitted to a Maryland trauma center tested positive for drugs only, about 16 percent tested positive for alcohol only. Approximately 10 percent tested positive for alcohol and drugs, and within this group, 50 percent were younger than age 25 years [26].

Studies conducted in several localities have found that approximately 4 to 14 percent of drivers who sustained injury or died in traffic accidents tested positive for delta-9-tetrahydrocannabinol, the active ingredient in marijuana [27].

In a study of fatally injured drivers from three Australian states (Victoria, New South Wales, and Western Australia), drugs other than alcohol were present in most of the cases. [15]. These included cannabis, stimulants, benzodiazepines, and other psychotropic drugs. Almost 10 percent of the cases involved both alcohol and other drugs. This study is to determine the significant factors associatedwith the use of these drug.

A Roadside studies by [10] indicated that one to fifteen percent of drivers drive under the influence of one or more drugs of abuse. Findings of this study showed that drivers most frequently test positive for the use of alcohol or cannabis. These two drugs affect driving ability and result in poor vehicle control.

Most drugs negatively affect driving ability, especially when used in combination with alcohol or another drug. It is of concern that a substantial number of drug users are not aware that their driving is impaired[10].

Progress has been made in Ghana in reducing the use of alcohol and drugs by commercial vehicle operators over the past few years. Drug use prevention and testing programs have been instituted by the Motto Traffic and Transport Unit (MTTU) of the Ghana Police Service.

II. Methodology

We employed the Logistic regression model analysis to determine the significantfactors of substance abuse by drivers.

All factors that believed to be determinants of the use and abuse of substance by these drivers were considered. These are determinants contributed to the likelihood of substance abuse by drivers.

Logistic regression model was employed to pick the significant factors that are believed to contribute to substance abuse in drivers. Firstly, a questionnaire was use to identify potential variables that are believed to have a significant influence on substance abuse by commercial vehicle drivers.

After which a logistic regression model was used to select those factors which were indicated to be significant. Finally, the final outcome was used to determine if the model is well fit and if the variables selected are important predictors for our models.

Significance of each of the explanatory (independent) variables is assessed by carrying out statistical tests of the significance of the coefficients. The overall goodness of fit of the model is then tested.

Finally, the model is validated by checking the goodness of fit and discrimination on a different set of data from that which was used to develop the model.

III. Descriptive and Data Distributions

a) Age Distribution

Commercial drivers between the ages of 31-50 years forms majority of the population. But there are few drivers between the ages of 21-30 years. Figure1 shows the population distributions of commercial drivers.

Table 1: Age Distribution

Age(years)	Number
21-30	41
31-40	92
41-50	87
51-60	55
61+	24

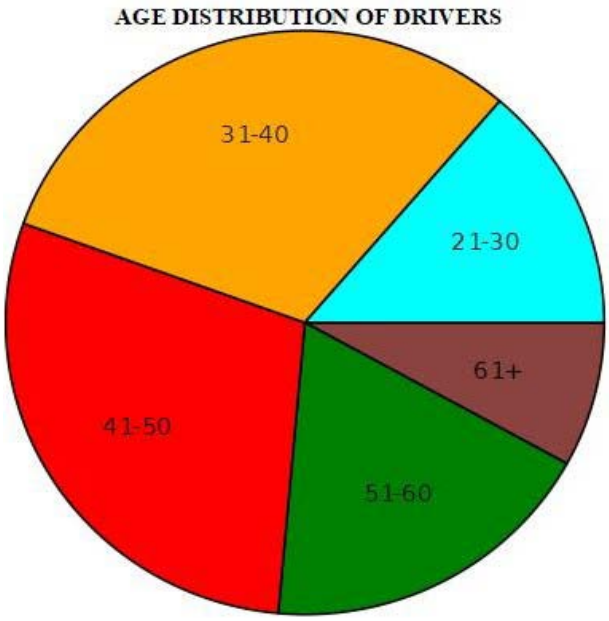

Figure 1: Age distribution of commercial drivers.

b) Religious Status

Many espondents are Christians and Muslims. However, both religions are against drugs and substance abuse. About 90 percent of these drivers come from both Islam and Christian religion. Table 2 shows the religious distributions of substance abuse by drivers from Islam and Christian religions.

Table 2: Religious Status

Religious Status	Number
Christianity	135
Islam	134
Traditional	31
Others	0

c) Educational Status

Approximately, 59 percent of the respondents meet the requirement of the Driverand Vehicle Licensing Authority (DVLA) of Basic Education Certificate Examination (BECE). Illiteracy level of the drivers who responded is higher. About 41 percent of the commercial drivers interviewed have never being to school. This is of greater concern since the interpretation of road signs requires a certain level ofbasic education. This account for the significance or the likelihood of substance use by drivers. Most commercial drivers do not even know the dangers of drug driving.

Table 3: Level of Education

Level of Education	Number
Never being to school	123
Primary/J.H.S	158
Secondary	19
Tertiary	0

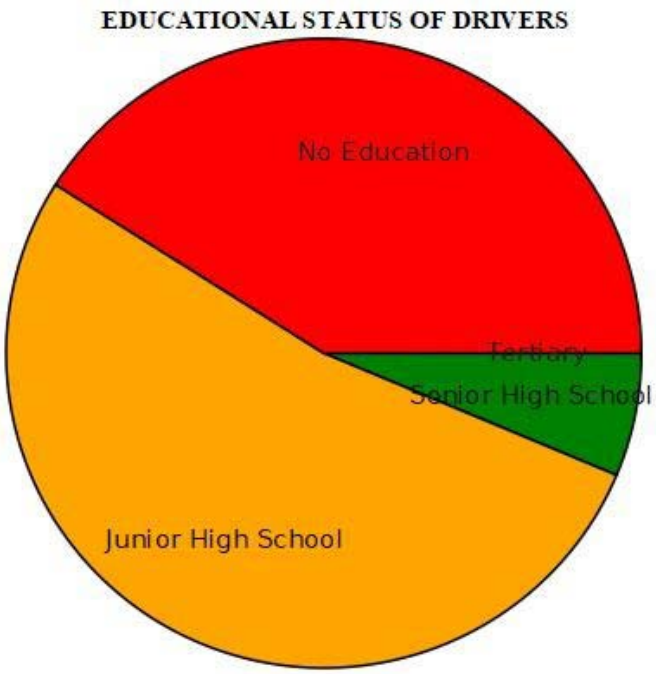

Figure 2: Educational background of commercial drivers.

d) Marital Status

A number of respondents are married and constituted about 66 percent of the total respondents. They are people who provide for the up keep of their families. Clearly, this explains why marital status is not a determinant of substance abuse by commercial drivers. There are no association between marital status and the use of drug by commercial drivers. Table 4 shows the marital status of commercial drivers used in the survey.

Table 4: Marital Status

Marital Status	Number
Single	49
Married	197
Devoice	50
Cohabiting	4

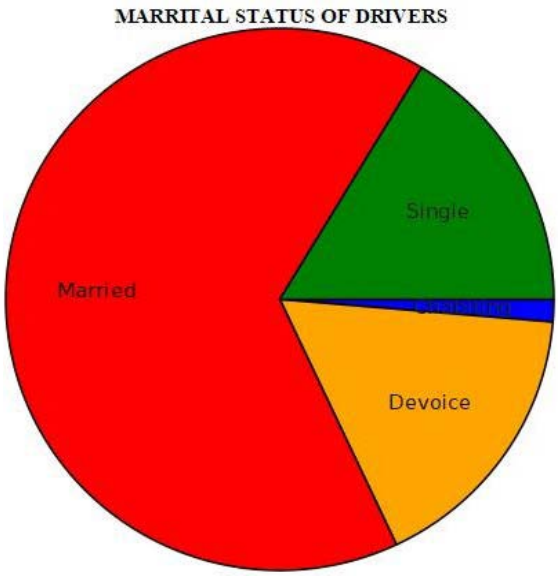

Figure 3: Marital status of commercial drivers.

e) Drug Use

Approximately, thirty four percent of the respondents confirmed the use of some substances to enhance their performance or keep them awake for long hours of driving.

Most drivers are of the view that the use of substances enables them to drive faster with concentration and to be able to go for more trips. All these comes with financial benefits according to most of them. Table 5 gives the distributions of response from drivers regarding the use of drugs.

Table 5: Drug Driving

Drug Use	Number of Driver(s)	Percentage
YES (1)	102	34.0
NO (0)	198	66.0

f) Type of Vehicle

Type of vehicle a driver uses determines time and distance expected to cover. Respondents who travel long hour are mostly used trailers and coaches. This is why those who use trailers and coaches use chemical substances as they usually travel long distances. Table 6 shows the various vehicles commonly used by drivers in the study.

Table 6: Type of Vehicle

Type of vehicle	Number
Trailer truck	67
Coaches/Bus	58
Cargo truck	75
Dumper truck	36
Mini Bus	28
Taxi	36

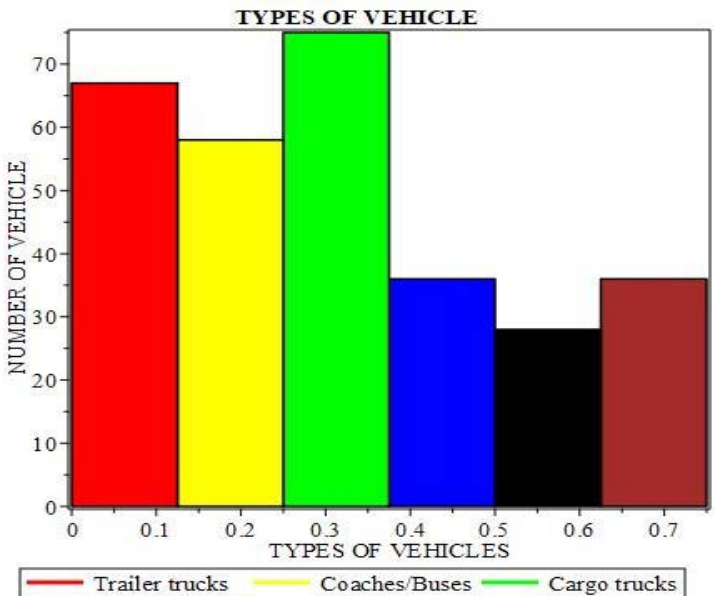

Figure 4: Types of vehicles used by commercial drivers.

g) Mode of Training

The manner in which drivers learn how to drive is a mojor concern for safety. Table 7 indicates that nearly 70 percent do not learn from the recognised or approved institutions. Drivers mostly learn from friends, family members or learning on job. Safety and safe driving is the priority of every driving institution.

Table 7: Mode of Driver Training

Training	Number
Driving School	87
Family/Friends	59
Learning on Job	55
Self Tutoring	49
Other	50

h) Time(Hrs) used to drive

Table 8 bellow indicates that more than 60 percent of the respondents drive for long hours ranging from 9 hours and above in a single trip. There is a relationship between substance use and hours of continuous driving. Stress and fatigue on the part of the respondents influences the use of some chemical substances. As the illiteracy rate of the respondents is high, they are unaware of the dangers associated with use of these drugs.

Table 8: Time used to drive

Time(Hrs)	Number
6	28
7	24
8	64
9	59
10+	125

i) Commonest Drugs Used by Drivers

Table 9 shows the commonest drugs usually administered by commercial drivers. In all, 102 respondents admitted to using some drugs as stimulants when driving. This represent 34 percent of the total respondents.

Table 9: Types of Drug Use by Drivers

Name of Drug	Common or Local Name(s)
Cannabis	Marijuana, Wee, Ganja
Opiates(Opium)	Codeine, Morphine, Pethidine
Volatile Inhalants	Spray, Glue, Gases
Tranquilizers(Sedatives)	Volume (5,10), Blue-Blue
Cocaine or Heroine	White powder, Brown sugar, Crack
Alcohol	Akpeteshi, Beer
Amphetamines(Stimulants)	Nescafe, Ataya
Cola Nuts	Goro, Bissi
Cigarette	King Size, 555, Embassy

j) Reasons for Drug Use

Table 10 shows the reasons given by the respondents for the use and abuse of drugs. The commonest among the reasons were as follows; Sleeping without drug, fatigue, drive long hours and pressure from car owners. Few of the respondents are of the view that there are no regular checks for drug driving as well as strict drug policy for drivers.

Table 10: Reasons for Drug Use

Reason	Number
Obtain peace and calm	14
Keeps you awake	34
Addiction	6
Relieves fatigue	26
Difficult driving without drug	33
Pleasure while driving	22

Do not know	5
Feels relaxed and drives easier	27
Makes one drive faster	25
Stay awake for hours	47
Pressure from car owners	27
No policy or punishment	9
No regular check points	12
Weight control behaviour	13

IV. Data Analysis

a) Analysis of Maximum Likelihood Estimates

Table 11 shows the output of the coefficients, standard errors, z-statistic (Wald z-statistic), and the associated p-values.

The logistic regression coefficients give the change in the log odds of the outcome for a one unit increase in the predictor variable. For every one unit change in distance traveled (800km), the log odds of drug use (versus not drug use) increases by 5.6288 and for every unit change in 700km, the log odds of drug use verses notuse increases by 6.2005.

For a one unit increase in time (9hrs), the log odds of being a drug user increases by 3.3789 and every unit change (7hrs), the log odds of being a drug user in- creases by 0.9470. Commercial drivers who learn on job, self taught and learn from friends are statistically significant but driving school is not significant. Mar- ital status is not statistically significant and therefore is not a determinant of drug use. Commercial drivers who travel long distances above 700 kilometers have significant p-values. This means that distance is a significant determinant of drug use by drivers.

Table 11: Coefficients

Coefficients	Estimate	Std. Error	z value	Pr(> |z|)
(Intercept)	-9.5176	2.8415	-3.350	0.000810 ***
age[21-30]	0.0000			
age[31-40]	-2.5937	1.1842	-2.190	0.028502 *
age[41-50]	-2.4622	1.2467	-1.975	0.048277 *
age[51-60]	-2.0518	1.3342	-1.538	0.124095
age[61+]	-0.8094	1.2458	-0.650	0.515888
distance[100]	0.0000			
distance[200]	2.0036	1.8626	1.076	0.282053
distance[300]	-0.4490	2.3589	-0.190	0.849028
distance[400]	0.4749	2.2327	0.213	0.831568
distance[500]	0.9555	2.1976	0.435	0.663724
distance[600]	2.8958	2.3134	1.252	0.210670
distance[700]	6.2005	2.2884	2.710	0.006738 **
distance[800]	5.6288	2.2048	2.553	0.010682 *
distance[900+]	7.6054	2.3340	3.259	0.001120 **
education[Never]	0.0000			
education[primary/JHS]	-1.4316	0.5744	-2.492	0.012692 *
education[secondary]	-4.6529	1.4413	-3.228	0.001246 **
mstatus[single]	0.0000			
mstatus[married]	1.4788	1.0258	1.442	0.149406
mstatus[devoice]	1.6542	1.1288	1.465	0.142801
mstatus[cohabiting]	-15.0934	1559.8634	-0.010	0.992280
religion[christianity]	0.0000			
religion[islam]	0.4423	0.6033	0.733	0.463455
religion[traditional]	2.4259	0.9491	2.556	0.010591 *

time[6]	0.0000			
time[7]	0.9470	1.6971	0.558	0.576826
time[8]	2.1849	1.1605	1.883	0.050100
time[9]	3.3789	1.2721	2.656	0.007903 **
time[10+]	4.0090	1.1156	3.594	0.000326 ***
training[driving school]	0.0000			
training[friends]	4.7524	0.8723	5.448	5.09e-08 ***
training[learning on job]	5.4805	1.0253	5.346	9.01e-08 ***
training[self tutoring]	1.6451	0.8461	1.944	0.051861 .
training[other]	0.7260	0.8414	0.863	0.388197
vehicle[trailer]	0.0000			
vehicle[mini bus]	1.0255	1.1606	0.884	0.376900
vehicle[dumper truck]	1.6553	1.5397	1.075	0.282337
vehicle[cargo truck]	-1.3082	0.7798	-1.678	0.093430 .
vehicle[coaches]	0.6760	1.9613	0.345	0.730355
vehicle[taxi]	1.2415	1.5229	0.815	0.414950

b) Odds Ratios(OR)

In Table 12, there is 95 percent confident that for a one unit increase in time,the odds of drug use by a commercial driver who drives for more than 10 hours versus not using drug increases by a factor of 5.509293e+01. The odds of drug use for a commercial driver using a dumper truck is between 2.894950e-01 and 1.353064e+02.

We are 95 percent confident that for a one unit increase in distance, the odds of drug use by a commercial driver who drives for than 900 kilometers versus not using drug increases by a factor of 2.008983e+03.

Table 12: ODDS RATIOS

Variable	ODDS RATIO	2.5 percent	97.5 percent
(Intercept)	7.354505e-05	1.428725e-07	1.121890e-02
age[31-40]	7.474196e-02	6.577162e-03	7.091162e-01
age[41-50]	8.524946e-02	6.531945e-03	9.100546e-01
age[51-60]	1.285092e-01	8.534147e-03	1.683472e+00
age[61+]	4.451276e-01	3.460478e-02	4.824807e+00
distance[200]	7.415634e+00	2.332663e-01	4.701014e+02
distance[300]	6.382445e-01	4.814157e-03	7.583486e+01
distance[400]	1.607809e+00	2.433147e-02	2.136692e+02
distance[500]	2.599846e+00	3.893110e-02	2.136692e+02
distance[600]	1.809758e+01	2.624222e-01	2.632232e+03
distance[700]	4.930109e+02	9.634324e+00	8.423085e+04
distance[800]	2.783408e+02	6.355358e+00	4.002675e+04
distance[900+]	2.008983e+03	3.548114e+01	3.683694e+05
education[primary]	2.389364e-01	7.227582e-02	7.044533e-01
education[secondary]	9.533762e-03	3.869645e-04	1.147145e-01
mstatus[married]	4.387837e+00	6.140997e-01	3.521826e+01
mstatus[devoice]	5.228772e+00	5.852233e-01	5.030545e+01
mstatus[cohabiting]	2.786201e-07	5.652233e-01	9.621607e+29
religion[islam]	1.556342e+00	4.807932e-01	5.267230e+00
religion[traditional]	1.131217e+01	1.897967e+00	8.108981e+01
time[7]	2.578066e+00	8.673554e-02	7.682196e+01

time[8]	8.889540e+00	1.039258e+00	1.058949e+02
time[9]	2.933885e+01	2.825415e+00	4.539337e+02
time[10+]	5.509293e+01	7.644572e+00	6.543038e+02
training[friends]	1.158582e+02	2.418215e+01	7.684636e+02
training[on job]	2.399782e+02	3.893176e+01	2.264460e+03
training[self taught]	5.181556e+00	1.023111e+00	2.937798e+01
training[other]	2.066831e+00	3.862077e-01	1.101892e+01
vehicle[mini bus]	2.788545e+00	3.074893e-01	3.069662e+01
vehicle[dumper truck]	5.234497e+00	2.894950e-01	1.353064e+02
vehicle[cargo truck]	2.703109e-01	5.435443e-02	1.201289e+00
vehicle[coaches]	1.965929e+00	3.906809e-02	9.421414e+01
vehicle[taxi]	3.460717e+00	2.210596e-01	9.827966e+01

V. Analysis of Deviance

a) Analysis of Deviance (Model 1: AIC=187.91)

Table 13 shows the backward elimination regression model-building technique was used to select the significant variable(s) into a fitted logistic regression model. This technique begins with a full model (i.e. model with all the variables under study) and deletes variable one by one until the model begins to degrade. Each deletion of variables from the model is explained in a sequence of Models. A 5 percent statistical significance level is required for a variable to stay in a model. Table bellow shows the results obtained from the full model (Model 1). From this model, Level of education with (p-value=3.114e-05 ***), time used to drivewith (p-value=0.0005852 ***) mode of training with (p-value=2.2e-16 ***) and distance traveled with (p-value=2.2e-16 ***) were the most significant variables associated with the use of drug by commercial drivers. The remaining variables such as age, religion and type of vehicle used were not significant. Therefore, this resulted to an Akaikes information criterion (AIC) statistic of 187.91

Table 13: Analysis of Deviance (Model 1: AIC=187.91)

Variable	Df	Deviance	Resid. Df	Resid. Dev	P(>|Chi|)
NULL				299	384.62
age	4	0.457	295	384.16	0.9775398
distance	8	114.079	287	270.09	2.2e-16 ***
education	2	20.754	285	249.33	3.114e-05 ***
mstatus	3	8.326	282	241.01	0.0397362 *
religion	2	3.673	280	237.33	0.1593930
time	4	19.651	276	217.68	0.0005852 ***
training	4	88.100	272	129.58	2.2e-16 ***
vehicle	5	7.668	267	121.91	0.1754806

b) Analysis of Deviance (Model 2: AIC=186.54)

In Model 2, variable Age was dropped because it was the least significant with the highest p-value as indicated in Table 14. This resulted in improving the Akaikes information criterion (AIC) by reducing it slightly from 187.91 to 186.54. Similarly to the results in Model 1, Level of education with (p-value=4.525e-05 ***), time used to drive with (p-value=0.0003287 ***) mode of training with (p- value=2.2e-16 ***) and distance traveled with (p-value=2.2e-16 ***) were the only variables that were significantly associated with the current use of drug in Model 2.

Table 14: Analysis of Deviance (Model 2)

Variable	Df	Deviance	Resid. Df	Resid. Dev	*P(>|Chi|)*
NULL				299	384.62
distance	8	113.542	291	271.08	2.2e-16 ***
education	2	20.006	289	251.07	4.525e-05 ***
mstatus	3	8.084	286	242.99	0.0443135 *
religion	2	3.035	284	239.95	0.2193018

time	4	20.918	280	219.04	0.0003287 ***
training	4	82.593	276	136.44	2.2e-16 ***
vehicle	5	7.902	271	128.54	0.1616969

c) Analysis of Deviance (Model 3: AIC=187.1)

In model third (3rd) model, the AIC statistic became worst. It increased from 186.54 to 187.1) when the variable 'Religion' was dropped as indicated in Table15.

Table 15: Analysis of Deviance (Model 3: AIC=187.1)

Variable	Df	Deviance	Resid. Df	Resid. Dev	*P(>|Chi|)*
NULL				299	384.62
distance	8	113.542	291	271.08	2.2e-16 ***
education	2	20.006	289	251.07	4.525e-05 ***
mstatus	3	8.084	286	242.99	0.0443135 *
time	4	21.594	282	221.40	0.0002414 ***
training	4	80.134	278	141.26	2.2e-16 ***
vehicle	5	8.158	273	133.10	0.1477385

d) Analysis of Deviance (Model 4: AIC=185.26)

Finally, in the fourth model, the AIC statistic became better when it was reduced from 187.1 to 185.26.

The variables: Level of education with (p-value=4.525e-05***), time used to drive with (p-value=0.0003287***) mode of training with (p-value=2.2e-16***) and distance traveled with (p-value=2.2e-16***) were the only variables that were significantly associated with the current use of drug in Model 4.

However, comparing the models 1, 2, 3 and 4 based on their AIC statistic, the fourth model was selected for yielding the least AIC at 185.26 as shown in Table16.

Table 16: Analysis of Deviance (Model 4: AIC=185.26)

Variable	Df	Deviance	Resid. Df	Resid. Dev	*P(>|Chi|)*
NULL				299	384.62
distance	8	113.542	291	271.08	2.2e-16 ***
education	2	20.006	289	251.07	4.525e-05 ***
mstatus	3	8.084	286	242.99	0.0443135 *
time	4	21.594	282	221.40	0.0002414 ***
training	4	80.134	278	141.26	2.2e-16 ***

e) Test of Overall fitness of the fitted model

The measure of how well our model fit is the significance of our overall model. We test for whether our model with predictors fits significantly better than our model with just an intercept (null model). The test statistic is the difference between the residual deviance for the model with predictors and the null model.

Table 17: Overall fitness of the model

Test	Value	DF	P-value
Chi-Square	121.91	267	7.093043e-16

The chi-square of 121.91 with 267 degrees of freedom and an associated p- value of 7.093043e-16 which is less than 0.005 tells us that our model as a whole fits significantly better than an empty model as shown in Table 17.

VI. Conclusion

Social determinants of substance abuse by drivers in Ghana were identified. Some factors were significantly associated with substance use and abuse by drivers. The following predictor variables are likely to influence the abuse of drug by commercial drivers: The distance covered, time (hours) used to travel, mode of training and the commercial driver educational level.

Educational levels of drivers was associated with substance use. Most widely used substances (drugs) among drivers in Ghana are alcohol, cannabis (marijuana), volatile inhalants (spray, glues),

amphetamines (stimulants such as nescafe, ataya) and cigarette. A number of drivers admitted to using some substances before driving. There are significant relationship between substance use and hours of continuous driving.

Most of the drivers learn how to drive from an unapproved driving schools. Approximately, 71 percent do not learn from the approved driving institutions. Learning from recognise driving schools should be encouraged by government. Safety and safe driving is the priority of every driving institution.

The model analysis shows that Level of education, time used to drive, mode of training and distance traveled were the most significant variables associated with the use and abuse of drugs by drivers. The remaining variables such as age, religion and type of vehicle used were not significant.

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Data Availability Statement

The data used in this study was obtained from a questionaire administered to selected number of commercial drivers in Ghana.

Conflict of interest

Author declare that there are no conflict of interest regarding the publication of this study.

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