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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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Abstract

Introduction: 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 influence drug driving. **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. **Results:** Commercial bus drivers who responded or participated in this study were male adults within the active age and forty 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 threatens our transportation industry and measures ought to be taking to address this problem.

Keywords

Drunk Driving, Substance Abuse, Marijuana, Odds Ratio, Accidents

1. 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. 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 influence drug 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 figure calls for review of the causes of these accidents.

Mir et al. (2012) 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 Bello et al. (2011a) 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 alcohol and marijuana while driving. A study that was conducted by Calhoun et al. (2004) determined the use of alcohol and marijuana in Pakistan commercial drivers. A sample of bus and truck drivers was 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 Mura et al. (2003). This study is to compare 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 Ahlm et al. (2009) 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 Verster (2009) on several commercial drivers and their Blood Alcohol Concentration (BAC) to determine 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 by Williams (2006) found that 17 percent of the drivers had a Blood Alcohol Concentration (BAC) above the legal limit. By comparing this figure to the European roadside studies by Gjerde et al. (2008), 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).

2. 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 Penning et al. (2010). 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 Penning et al. (2010). A research conducted by Ellborg et al. (1957) reported no difference in simulated driving performance between those who smoked a cigarette during the test and control subjects. The results in the study conducted by Ellborg et al. (1957) clearly indicate that smoking does not influence or enhance driving performance.

Penning et al. (2010) however, indicated that when smokers had to refrain from smoking, they performed significantly worse. Surprisingly, a study conducted by Penning et al. (2010) confirmed that driving performance of craving smokers significantly improved to normal (non-smoker) levels after allowing them a cigarette.

Cannabis is to be the next most common drug of abuse found in drivers after alcohol Penning et al. (2010). A study from New Zealand reported that almost 21 percent of young drivers admitted that they had driven at least once after smoking cannabis Ferguson et al. (2008). Approximately 60 percent of the interviewed

Australian nightclub attendees reported that they were driven home by someone under the influence of tetrahydrocannabinol (THC) or that they drove themselves after smoking cannabis Sherwood (1995). Roadside studies by Penning et al. (2010) 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 Soderstrom et al. (2001). 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 Drummer et al. (2004). 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 Osman et al. (2016).

3. Road Accidents Related to Drugs and Substance Abuse

Generally, inhalants are commonly abused drugs by some commercial drivers in Ghana. The findings of Bello et al. (2011b) indicated that 0.1 percent of Spanish drivers admitted 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 et al. (2003). 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 Bennett et al. (2000).

Bennett et al. (2000) examined 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.

Dinwiddie et al. (1994) report 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. Kurtzman et al. (2001) supported these findings and added, slurred speech, euphoria and decreased reflexes as commonly reported side effects.

Crouch et al. (1993) Reported that 7 percent of fatally injured truck drivers had used methamphetamines, 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.

Miller et al. (1993) 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.

Silber et al. (2005) tested the effects of dexamphetamine, a drug with similar effects as methamphetamine. This drug significantly impaired simulated driving performance during daytime testing. But night-time testing showed no significant differences from placebo were found. Gustavsen et al. (2006) reviewed literature on amphetamine and methamphetamine and the findings are that low dosages of amphetamine significantly improve psychomotor performance of fatigued subjects. Logan (2002) came out with the conclusion that most studies that examined the behavioral effects of stimulant drugs report an increase in risk taking behaviour and impaired decision making. Penning et al. (2010) 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 as ketamine, inhalants and anabolic steroids, but suggest a negative effect on driving performance Penning et al. (2010).

A number of studies have examined illicit drug use in drivers involved in motor vehicle crashes, reckless driving, or fatal accidents. One study found that about 34 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 (Walsh et al., 2004; Kanyaa et al., 2018).

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 Ramaekers et al. (2004). 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 Drummer et al. (2004). These include 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 associated with the use of these drugs.

A Roadside studies by Penning et al. (2010) 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 Penning et al. (2010).

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.

4. Methodology

We employed the Logistic regression model analysis to determine the significant factors 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 used 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. The logistic regression coefficients were introduced to determine or give the change in the log odds of the outcome for a one unit increase in the predictor variable. For every one unit change, the log odds of drug use (versus not drug use) increases and for every unit change. 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.

5. Descriptive and Data Distributions

5.1. Age Distribution

Commercial drivers between the ages of 31 - 50 years form majority of the population. But there are few drivers between the ages of 21 - 30 years. Figure 1 and Table 1 show the population distributions of commercial drivers.

5.2. Religious Status

However, a number of respondents 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.

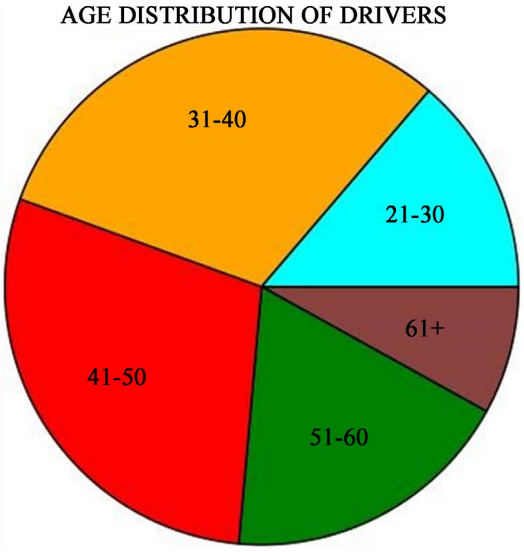

Figure 1. Age distribution of commercial drivers.

Table 1. Age distribution.

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

Table 2. Religious status.

Religious Status	Number
Christianity	135
Islam	134
Traditional	31
Others	0

5.3. Educational Status

Approximately, 59 percent of the respondents meet the requirement of the Driver and 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 of basic education. This accounts 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 and Figure 2 show the educational levels of commercial drivers.

5.4. 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 and Figure 3 show the marital status of commercial drivers used in the survey.

5.5. 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

Table 3. Level of education.

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

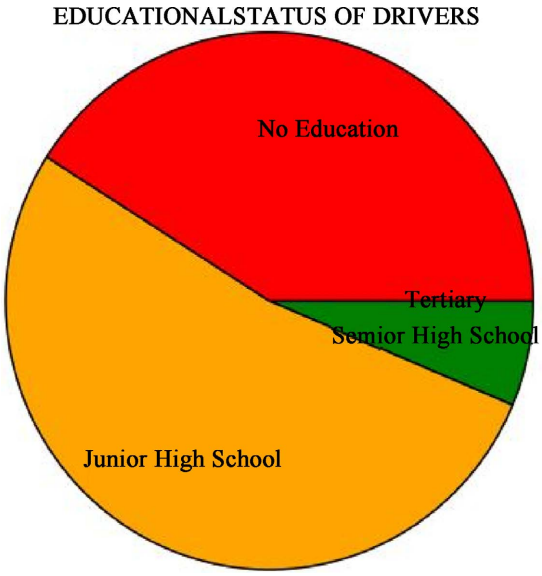

Figure 2. Educational background of commercial drivers.

Table 4. Marital status.

Marital Status	Number
Single	49
Married	197
Devoice	50
Cohabiting	4

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 come with financial benefits according to most of them. Table 5 gives the distributions of response from drivers regarding the use of drugs.

5.6. 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 and Figure 4 show the various vehicles commonly

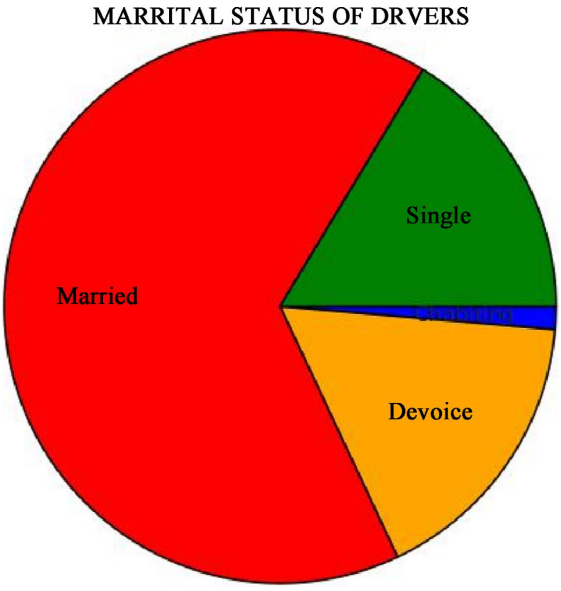

Figure 3. Marital status of commercial drivers.

Table 5. Drug driving.

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

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

used by drivers in the study.

5.7. Mode of Training

The manner in which drivers learn how to drive is a major concern for safety. Table 7 indicates that nearly 70 percent do not learn from recognise 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 shows how commercial drivers learned how to drive.

5.8. 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.

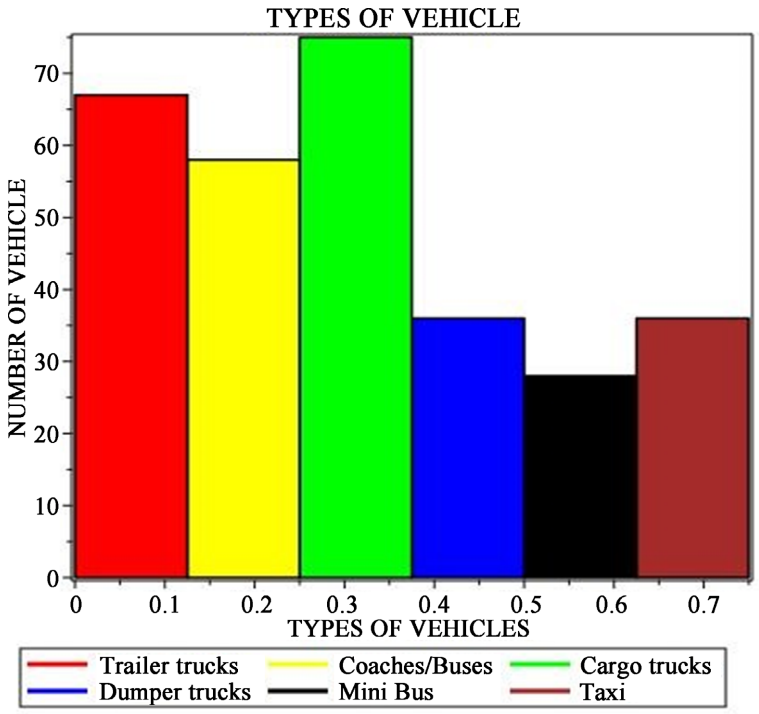

Figure 4. Types of vehicles used by commercial drivers.

Table 7. Mode of driver training.

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

As the illiteracy rate of the respondents is high as indicated in Table 8, they are unaware of the dangers associated with use of these drugs.

5.9. 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 represents 34 percent of the total respondents.

5.10. 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.

6. Data Analysis

We employed the concepts of maximum likelihood estimates, odds ratio, analysis of deviance and goodness of fit test to analyse the data.

The logistic regression coefficients were introduced to determine or give the change in the log odds of the outcome for a one unit increase in the predictor variable. Backward elimination regression model-building technique was used to

Table 8. Time used to drive.

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

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

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

select the significant variable(s) into a fitted logistic regression model. This technique begins with a full 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.

6.1. 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 (800 km), the log odds of drug use (versus not drug use) increases by 5.6288 and for every unit change in 700 km, the log odds of drug use verses not use increases by 6.2005.

For a one unit increase in time (9 hrs), the log odds of being a drug user increase by 3.3789 and every unit change (7 hrs), the log odds of being a drug user increase by 0.9470. Commercial drivers who learn on job, self-taught and learn from friends are statistically significant but driving school is not significant. Marital 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.

6.2. Odds Ratios (OR)

In Table 12, there is 95 percent confident that for a one unit increase in time,

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

Continued

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	[15]1.9613	0.345	0.730355
vehicle [taxi]	1.2415	1.5229	0.815	0.414950

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

Continued

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

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

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 are 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.

7. Analysis of Deviance

7.1. 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 below 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 drive with (p-value = 0.0005852***) mode of training with (p-value = 2.2e−16***) and dis-

tance 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.

7.2. 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.

7.3. 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 Table 15.

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

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

7.4. 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 Table 16.

7.5. 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.

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.

8. 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 were associated with substance use. Most widely used substances (drugs) among drivers in Ghana are alcohol, cannabis (marijuana),

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***

Table 17. Overall fitness of the model.

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

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 school. Approximately, 71 percent do not learn from the approved driving institutions. Learning from recognising 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 questionnaire administered to selected number of commercial drivers in Ghana.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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