

# Open secret, or imagined problem: Drug and alcohol use in Tanzanian road traffic accident drivers

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## Research article

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# Abstract

## Background

Road traffic accidents (RTAs) have emerged as an important public health problem in low and middle-income countries, where 90% of RTA deaths occur. The World Health Organization has suggested strategies to address excess mortality from RTAs including efforts to combat driving while intoxicated. The association between substance use and RTAs is well known in high-income countries, but data is more limited in low-resource settings including Tanzania. The objective of this study is to examine the prevalence of drug use, alcohol use, and substance use disorders in Tanzanian RTA drivers.

## Methods

This prospective observational study was conducted in the Emergency Department of Muhimbili National Hospital, a national referral hospital in Dar es Salaam, Tanzania. Research assistants available 24 hours per day enrolled adult drivers who presented within 24 hours of an RTA. In eligible patients, research assistants collected a saliva test of blood alcohol content (BAC) and a urine drug screen (UDS), and administered a validated substance abuse screening tool, the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST). Patients were excluded from individual analyses if they could not produce a saliva or urine test or answer questions. Primary outcomes were rates of positive BAC, UDS and self-reported high-risk alcohol and drug use patterns. Descriptive statistics were calculated using Excel.

## Results

We screened 5264 trauma patients and enrolled 538, in whom 191 had a BAC, 362 had a UDS, and 417 had a complete ASSIST. Fifteen of 191 patients (7.8%) had a positive BAC, and 68/362 (18.7%) patients had a UDS that was positive for at least one drug. Based on the ASSIST, 104/417 (24.5%) of patients were at moderate or high risk for alcohol use disorder. Few were at risk for disordered use of other non-tobacco substances.

## Conclusion

In our population of drivers presenting within 24 hours of an RTA, positive BAC and UDS tests were rare. A substantial portion of the population was at moderate to high risk for an alcohol use disorder. Ideal screening for substance use in trauma populations may involve a verbal screening tool, particularly when the time between injury and hospital arrival is delayed.

## Background

The incidence of road traffic accidents (RTAs) has risen precipitously in the last decade, resulting in a new epidemic of injury that disproportionately affects low- and middle-income countries (LMICs). Data from across low resource settings demonstrates rising rates of morbidity and mortality, particularly in urban areas with rapidly increasing rates of motorization.(1) Alcohol and illicit drug use are a well-established risk factor for road traffic accidents and are associated with increased injury severity. The link between substance use and RTAs has largely been documented in high-income countries. In contrast, the role of substance use in road traffic accidents in low-income countries remains to be explored.(2)

In high-income countries, the known association of alcohol and drug use with trauma has facilitated unique opportunities to incorporate alcohol and drug screening into emergency care. To increase the detection rates of substance abuse, many hospitals in high-resource settings have incorporated discretionary or routine laboratory screening for drug and alcohol use into trauma care algorithms.(3) However, this strategy is expensive and may not be feasible in low resource settings. Further study is needed on the value of laboratory testing, including blood alcohol content (BAC) level and urine drug screen (UDS), relative to lower-cost options such as questionnaires in identifying patients using drugs and alcohol.

In Tanzania, intoxication among drivers has been poorly studied but appears to be common, with some noting, “it is an open secret that drivers drink and drive with impunity.”(4) Preliminary work by Mundenga *et al.* (2019) assessed for objective evidence of drug and alcohol use in trauma patients presenting to the Emergency Department (ED) of Muhimbili National Hospital (MNH) within twelve hours of injury. They found that 49% of patients tested positive for alcohol by breathalyzer or saliva testing strips, and 36% of patients tested positive for illicit drugs by urine screening.(5) While this study identified recent substance use in trauma patients, the prevalence of underlying substance use disorders in this population is not well understood.

In this study, we evaluated the rates of recent drug and alcohol use and underlying substance use disorders in Tanzanian RTA drivers, in whom substance use is most likely to increase morbidity and mortality on both an individual and population level.

## Methods

### Study setting

Patients were enrolled at MNH in Dar es Salaam, the most populated city of the East African nation of Tanzania. MNH is the largest tertiary care hospital in the nation and the site of the first public ED in the country, built in 2010. The ED, which is staffed 24-hours per day, 7 days per week by residency-trained Emergency Physicians, receives referrals from district and regional hospitals around the country. The department sees an annual volume of approximately 65,000 patients, including an estimated 10% who present due to an injury. Since 2016, all trauma patients have been prospectively enrolled in a trauma databank by trained research assistants who record patients’ baseline characteristics, mechanism of

injury, injury severity score at ED presentation, ED care and disposition, as well as 24-hour, 30-day, 90-day, 180-day and 1-year mortality. Additional screening for substance abuse as detailed below was integrated into enrollment in the trauma databank from December 4th, 2018 until September 1st, 2019.

## **Study population**

We conducted a prospective, observational trial of consecutive adult patients (age  $\geq 18$ ) who presented to the MNH ED due to injuries sustained as the driver in a RTA. Drivers were enrolled up to 24 hours after the time of the accident. We included drivers of all motorized vehicles including cars, trucks, buses, motorcycles, and *bijajs* (open-air three-wheeled vehicles commonly used in Tanzania). Patients were identified by trained research assistants who screened the ED electronic tracking board 24-hours per day, seven days per week for chief complaints related to trauma. Patients were excluded from questionnaire testing if they (a) were unable to consent due to being unresponsive or confused, (b) did not speak English or Swahili, or (c) refused to answer questions. Patients were excluded from urine drug testing analysis if they were unable to produce a urine sample, and catheterization was not indicated for routine care purposes. Patients were excluded from alcohol saliva test results if they unable to produce a saliva sample, or if copious blood was present in the oral cavity.

## **Data sources/measurement**

### **Alcohol and Drug Screening**

Patients meeting enrollment criteria were asked to produce a urine and saliva sample. If a patient was unable to produce a urine sample and a urinary catheter was placed for clinical care, urine from the catheter bag was sampled. BAC was measured from saliva samples using qualitative alcohol saliva test strips W53-S (Wondfo, Willowbrook, IL, USA). Urine samples were tested using a RapidCheck nine-panel multi-drug test card (Craig Medical, Vista, CA, USA). The time of sample collection and results were recorded. To minimize bias, drug and alcohol tests were interpreted prior to questioning patients about substance use patterns. Urine and saliva testing cards were reviewed by study authors (PN, AD) to ensure appropriate interpretation of the results.

### **Patient-reported substance use patterns**

To assess general substance use patterns by patient report, we used the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) version 3.0, a tool developed for the World Health Organization by international substance abuse researchers to screen for high risk use of alcohol, tobacco, cannabis, cocaine, amphetamine-type stimulants, sedatives, hallucinogens, inhalants, opiates, and “other drugs” that do not fall into one of the above categories.(6) This tool was validated in seven countries, including one country in Sub-Saharan Africa (Zimbabwe), and has been widely used in low and middle-income countries.(7) We used an English language source, which was translated by two separate Swahili native-speakers fluent in English. Discrepancies in the two Swahili-language versions were adjudicated by a bilingual author (PN) whose native language is Swahili. After patients consented to participation,

research assistants verbally administered the Swahili or English language ASSIST depending on patient's preferred language.

## Study size

We calculated our sample size based on data from a study by Mundenga, *et al.* which found that among trauma patients presenting to MNH within 12 hours of injury, 57% tested positive for either drugs or alcohol.(5) Assuming a positive screening rate of 50% in our study population, we calculated that assessment of 385 subjects would provide a confidence level of 95% that our point estimate of the positive screening rate would fall within  $\pm 5\%$  of the real value, measured/surveyed value.

## Quantitative variables

The ASSIST consists of seven items assessing the frequency of use or problems associated with use of each of ten substance domains (alcohol, tobacco, cannabis, cocaine, amphetamine-type stimulants, sedatives, hallucinogens, inhalants, opiates, and "other drugs"), as well an eighth question that assesses use of drugs by injection. The minimum score for each domain is zero, and the maximum score is 36. In validation studies of the ASSIST, the authors suggest that for alcohol, scores of 0–10 be considered low risk use, scores of 11–26 be considered moderate risk use, and score of  $\geq 27$  be considered high-risk use. For all other substances, cut-offs of 0–3 are used for low risk use, 4–26 for moderate risk use, and  $\geq 27$  for high risk use.(7) Here, we use these score cut-offs to characterize patients as being low, medium or high risk for disordered use of each substance domain.

## Data analysis/statistical methods

We report descriptive statistics on the prevalence of a BAC  $> 0.0$  mg/dL (stratified by the qualitative levels provided by the assay: 0–20 mg/dL, 20–80 mg/dL, 80–300 mg/dL and  $> 300$  mg/dL), the prevalence of positive UDS (stratified by drug), the prevalence of ASSIST score  $\geq 27$ , the proportion of patients with a positive BAC who had an alcohol specific substance score on the ASSIST of 0–3, 11–26, and  $\geq 27$ , and the proportion with a positive UDS who had a drug-specific score of 0–3, 4–26, and  $> 27$ . Study data were collected and managed using REDCap electronic data capture tools hosted at Muhimbili National Hospital.(8, 9) REDCap (Research Electronic Data Capture) is a secure, web-based software platform designed to support data capture for research studies, providing 1) an intuitive interface for validated data capture; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for data integration and interoperability with external sources. The data were analyzed in Microsoft Excel (Microsoft Corporation, Redmon, WA, USA) and are summarized with descriptive statistics.

## Results

### Participants:

We screened 5264 eligible trauma patients over the study period. A total of 538 patients were identified as adult drivers in road traffic accidents and presented to the ED of MNH within 24hrs of the injury (Fig. 1). The majority of our patients were male (n = 520, 96.7%), young (median age 30, IQR 25–36) and drove motorcycles (83.6%) or cars (11.9%) (Table 1). Nearly two thirds of patients were transferred to our facility from outlying hospitals. The median time between injury and ED arrival was 5.77 hours (IQR 3.76-9.37hs) for those referred from another facility vs 4.2 hours (IQR 1.73–9.73) for those presenting directly to the MNH ED.

Table 1  
Descriptive characteristics of patients enrolled

<b>Total patients</b>	<b>538</b>
Median age, years (IQR)	30 (25–36)
Gender, female (%)	17 (3.1%)
Vehicle driven (%)	442 (83.6%)
Motorcycle	64 (11.9%)
Car	1 (0.2%)
Bus	23 (4.3%)
Bajaj	
Referred from other hospitals	351 (65.2%)
Yes	187 (34.8%)
No	
Alcohol Saliva Swab obtained (%)	191 (35.5%)
Not obtained (%)	347 (64.5%)
<i>Reason: Unable to produce sample</i>	103 (29.7%)
Intubated	6 (1.7%)
Copious blood in mouth	87 (25.1%)
Lack of consent	32 (9.2%)
Not documented	119 (34.3%)
Urine drug screen obtained (%)	362 (67.3%)
Not obtained (%)	176 (32.7%)
<i>Reason: No urine sample available</i>	52 (29.5%)
Not documented	124 (70.5%)
ASSIST completed (%)	417 (77.5%)
Not administered (%)	121 (22.5%)
<i>Reason: Patient altered</i>	9 (7.4%)
Patient refusal	101 (83.5%)
Not documented	11 (9.1%)
IQR = interquartile range. ASSIST = Alcohol, Smoking and Substance Involvement Screening Test.	

BAC testing was available for 191 patients, or 35.5% of the study population. BAC was not available in 347 (67.3%) because either they were unable to produce a saliva sample (103 patients, 29.7% of those without BAC), due manufacturer recommended test contraindications such as intubation (6 patients, 1.7%) or copious blood in the mouth (87 patients, 25.1%), or due to lack of consent (32 patients, 9.2%). The reason was not documented in 119 patients (34.3%). The majority (176, 92.1%) of patients who had BAC testing had levels < 20 mg/dL. Fourteen patients (7.3%) had BAC levels 20–80 mg/dL, and one patient had a level of 80–300 mg/dL. No patients had BAC levels > 300 mg/dL (Table 2).

Table 2  
Blood alcohol content levels by saliva testing

<b>N = 191, Count (%)</b>	
0–20 mg/dL	176 (92.1%)
20–80 mg/dL	14 (7.3%)
80–300 mg/dL	1 (0.5%)
> 300 mg/dL	0 (%)

A urine drug screen (UDS) was available for 362 patients (67.3%), and was not obtained in 176 (23.7%). Of those who did not receive a UDS, 52 patients (29.5%) did not have urine available, and the reason was not documented in 124 patients (70.5%). 68 (18.7%) had a positive result for at least one illicit substance. The most commonly detected illicit substance was tetrahydrocannabinol (THC) (n = 34, 9.4%), the active compound in marijuana, followed by benzodiazepines (n = 28, 7.7%), phencyclidine (PCP) (n = 5, 1.4%), non-methadone opiates (n = 4, 1.1%), methadone (n = 1, 0.3%), barbiturates (n = 3, 0.8%), and cocaine (n = 1, 0.3%).

Table 3  
Urine Drug Screen

	<b>N = 362 Count (%)</b>
<b>All Negative</b>	<b>294 (81.2%)</b>
<b>At Least One Positive</b>	<b>68 (18.7%)</b>
Benzodiazepines	28 (7.7%)
Barbiturates	3 (0.8%)
Cocaine	1 (0.3%)
THC	34 (9.4%)
Methamphetamines	0 (0%)
Opiates	4 (1.1%)
PCP	5 (1.4%)
Amphetamines	0 (0%)
Methadone	1 (0.3%)
THC = tetrahydrocannabinol. PCP = phencyclidine	

A total of 177 patients had both a UDS and BAC level completed. Of these, three (1.7%) had both a positive UDS and BAC, all of which were positive for THC and one of which was positive for THC and PCP. Nine patients (5.1%) had a positive BAC and a negative UDS, 23 patients had a positive UDS and a negative BAC (13.9%) and in 142 patients (80.2%) both tests were negative.

The ASSIST tool was completed for 417 patients (77.5%). Of the 121 (22.5%) of patients who did not have a complete ASSIST tool, 9 (7.4%) were altered, 101 (83.5%) refused consent, and the reason was not documented for 11 (9.1%). 29 patients (6.9%) were at high risk for an alcohol use disorder, and 75 patients (18.0%) were at medium risk for an alcohol use disorder. Seventeen (4.1%) patients were at high risk for a tobacco use disorder, while 47(11.3%) were at medium risk for a tobacco use disorder. Only one patient (0.2%) as at high risk for an opiate use disorder, and no patients were at high risk for use disorders of other substances. Thirteen patients (3.1%) were at medium risk for a cannabis use disorder. Few patients were at high risk for use disorders of other substances included sedatives (n = 1, 0.2%), hallucinogens (n = 1, 0.2%), or opiates (n = 2, 0.5%) (Table 4).

Table 4  
ASSIST Scores

	<b>Low risk (Score 0–3 for drugs, 0–10 for alcohol)</b> <b>N = 417 Count (%)</b>	<b>Medium risk (Score 4–26 for drugs, score 11–26 for alcohol)</b> <b>N = 417 Count (%)</b>	<b>High risk (Score &gt;/= 27)</b> <b>N = 417 Count (%)</b>
Tobacco	353 (84.7%)	47 (11.3%)	17 (4.1%)
Alcohol	313 (75.1%)	75 (18.0%)	29 (6.9%)
Cannabis	404 (96.9%)	13 (3.1%)	0 (0%)
Cocaine	416 (99.8%)	1 (0.2%)	0 (0%)
Amphetamines	417 (100%)	0 (0%)	0 (0%)
Inhalants	417 (100%)	0 (%)	0 (0%)
Sedatives	416 (99.8%)	1 (0.2%)	0 (0%)
Hallucinogens	416 (99.8%)	1 (0.2%)	0 (0%)
Opioids	414 (99.3%)	2 (0.5%)	1 (0.2%)
Other drugs	417 (100%)	0 (0%)	0 (0%)

Among the 29 patients who were at high risk for an alcohol use disorder, 8 (27.6%) were also at high risk for a tobacco use disorder. None were high risk for a use disorder of another substance, however two patients (6.7%) were also at a medium risk for a cannabis use disorder, including one patient (3.4%) who was at medium risk for both cannabis and cocaine use disorder. Among the 75 patients who were at medium risk for an alcohol use disorder, three (4%) were at high risk for a tobacco use disorder, and 35 (46.7%) were at medium risk for a tobacco use disorder. Eleven (14.7%) were at medium risk for a cannabis use disorder. Ten patients (13.3%) were at medium risk for a use disorder of alcohol, tobacco and cannabis use.

Among the fifteen patients who had a positive BAC, one was high risk for an alcohol use disorder (score of 33), and six (46.7%) were medium or high risk for an alcohol use disorder. The sole patient who presented with an BAC level between 80–300 mg/dL had a low risk ASSIST score for alcohol (score of 0, reporting no lifetime alcohol use) (Table 5). Among the seven patients who had a BAC of 20–80 mg/dL, four had ASSIST score of 0 (reporting no lifetime alcohol use).

Table 5  
Blood alcohol content (BAC) and ASSIST scores for alcohol

	<b>Low risk (0–10) Count (%)</b>	<b>Medium risk (11–26) Count (%)</b>	<b>High risk (≥ 27) Count (%)</b>
BAC 0–20 mg/dL (N = 175)	127 (72.5%)	36 (20.5%)	12 (6.9%)
BAC 20–80 mg/dL (N = 14)	7 (50%)	6 (42.9%)	1 (7.1%)
BAC 80–300 mg/dL (N = 1)	1 (100%)	0 (0%)	0 (0%)
BAC > 300 mg/dL (N = 0)	0	0	0

Among patients had who a UDS that was positive for an illicit substance, only one patient who was positive for methadone had a score indicating high risk for dependence on that substance (score of 34). Six patients who had a positive UDS for THC (17.6%) were at medium risk for a cannabis use disorder (Table 6). The one patient who had a positive UDS for cocaine had an ASSIST score of 0 for cocaine (reporting no prior uses of that substance). All four patients who had a UDS positive for opiates had an ASSIST score of 0 for opiates. One of the five patients (80%) who tested positive for PCP was at medium risk for a use disorder of hallucinogens; the four others had an ASSIST score of 0 for hallucinogens.

Table 6  
Positive urine drug screen and ASSIST scores for substance associated domain

	<b>Low risk (0–3) Count (%)</b>	<b>Medium risk (4–26) Count (%)</b>	<b>High risk (≥ 27) Count (%)</b>
+Benzodiazepines (Sedatives) N = 27	27 (100%)	0 (0%)	0 (0%)
+Barbiturates (Sedatives) N = 3	3 (100%)	0 (0%)	0 (0%)
+Cocaine (Cocaine) N = 1	1 (100%)	0 (0%)	0 (0%)
+THC (Marijuana) N = 34	28 (82.3%)	6 (17.6%)	0 (0%)
+Methamphetamine (Amphetamine/Stimulants) N = 0	0 (0%)	0 (0%)	0 (0%)
+Opiates (Opiates) N = 4	4 (100%)	0 (0%)	0 (0%)
+PCP (Hallucinogens) N = 5	4 (80%)	1 (20%)	0 (0%)
+Amphetamine (Amphetamine/Stimulants) N = 0	0 (100%)	0 (100%)	0 (100%)
+Methadone (Opiates) N = 1	0 (0%)	0 (0%)	1 (100%)
. THC = tetrahydrocannabinol. PCP = phencyclidine			

For screening for alcohol use, relying on objective testing alone would have identified one patient who had driven with a BAC > 80 mg/dL, and 14 others with a BAC > 20 mg/dL; this strategy would have missed 48 patients who were medium to high risk for an alcohol use disorder but who had a BAC of 0 mg/dL. Relying only the ASSIST score would have identified 104 patients who were medium or high risk for an

alcohol use disorder by self-report, but would have missed the one patient driving with a BAC > 80 mg/dL, and would have missed 7 patients driving with a BAC > 20 mg/dL.

For screening for other substances, relying on objective testing would have identified 68 patients with a positive UDS, but would have missed 7 patients who were medium risk for cannabis, one patient who was medium risk for cocaine, one patient who was at medium risk for sedatives, and one patient who was at medium risk for opiates. Relying only on the ASSIST score would have identified 19 patients who were at medium to high risk for use of illicit drugs, but would have missed 27 patients who had a positive UDS for benzodiazepines, 3 patients who had a positive UDS for barbiturates, one patient who had a positive UDS for cocaine, four patients who had a positive UDS for opiates, and four patients who had a positive UDS for PCP.

## Discussion

In our population of RTA drivers, relatively few patients had positive SA test within 24 hours of presentation, with only one driver having a BAC above the legal limit of 0.08%.<sup>(10)</sup> Others (< 20%) had a UDS that was positive for an illicit substance, though some of these may have been administered prior to ED arrival as part of emergency care. Using a validated substance abuse screening tool, nearly one quarter of our population was at medium or high risk for an alcohol use disorder. Few other patients (< 5%) were at medium or high risk for a use disorder of illegal drugs based on self-report. The results of the saliva alcohol and urine drug testing were often discordant with patient-reported behaviors.

This study builds upon prior work at our center that screened adult trauma patients for substance abuse within 12 hours of injury. Of the 143 patients enrolled, they found that 67 (47%) had a positive alcohol test. Drug testing was performed in 122, of whom 78 (64%) had a positive UDS. The most common drugs detected were marijuana (24.5% of patients), opioids (11.5%), benzodiazepines (9.8%) and amphetamines (2.5%). Our study builds upon this work by narrowing focusing on RTA drivers, in whom recent psychoactive substance use presents the greatest public health threat. We found fewer patients with positive alcohol and drug screens, which may suggest that drivers are less likely to drink alcohol before driving than previously thought. However, this result may also be due to our inclusion of patients up to 24 hours after injury, which may have decreased detection rates as patients metabolized any alcohol ingested.

Other work in Tanzania has demonstrated that alcohol use disorders are common, and that illicit drug use is on the rise. In a study of youths in Northern Tanzania, 11–28% of males screened positive for an alcohol use disorder<sup>(11)</sup>, similar to what we report in our largely male, young population. Additionally, the profile of illicit drugs that our patients endorsed using reflects trends reported throughout Tanzania, which are thought to be due to the country's increased importance in drug transit routes as an entry point for drugs from Asia and South America.<sup>(12, 13)</sup>

The low number of positive SA tests in our study was likely in part related to the time between injury and ED presentation, which was prolonged in both referred and non-referred patients. For instance, seven of

the fourteen patients with a BAC of 20 mg/dL – 80 mg/dL arrived at our ED more than four hours after injury time. If these patients metabolized alcohol at a standard rate of 15 mg/dL per hour, their BAC would have been higher than the legal limit at time of injury. This effect was seen in both referred (n = 3) and non-referred patients (n = 4). The referral status of a number of our patients may have decreased the specificity of the UDS results for substances such as benzodiazepines and opiates. Nineteen of the 27 patients who had a positive test UDS for benzodiazepines and two of the four patients with a UDS positive for opiates had been referred from another facility. Medications given at referring facilities are often not well documented. While we attempted to enroll patients and collect samples as soon as possible after arrival and stabilization, we did not prospectively collect data on administration of benzodiazepine and opiates in the ED. Finally, we excluded many obtunded patients, which resulted in enrolment of a less severely injured population. Only patients with the ability to converse were able to participate in the ASSIST score. To attempt to include sicker patients, we applied for and received a waiver of informed consent from the institutional review board for the BAC and UDS testing. However, the saliva assay we used was not recommended for use with the presence of an endotracheal tube and required an expectorated sample, so was not available for patients who were intubated or could not follow instructions. We anticipate that these exclusions biased our study toward lower rates of positive BAC tests.

The findings of this study can help inform the optimal substance abuse screening strategy to identify patients who would benefit from brief intervention or referral for further treatment. Here, the saliva alcohol testing identified relatively few patients with positive screens. UDS was positive in a somewhat higher number of patients, however these results are somewhat confounded by potential iatrogenic use, as well as the variable metabolism of these different substances. In contrast, the ASSIST tool identified many more patients who could be targeted for interventions on responsible alcohol use than the saliva alcohol test, but had fewer positive results than the UDS. Relying only on the ASSIST tool for screening would have missed a few patients with concerning laboratory evidence of substance use, including the one patient with a BAC greater than the legal limit and patients with evidence of cocaine and cannabis use. The benefit of the ASSIST tool is that it is cost-effective, does not rely on laboratory reagents, and can screen for a vast array of substances including tobacco and alcohol. The ideal strategy may involve collection of a blood or saliva alcohol and urine drug screen paired with a validated survey tool. These results should be weighed in the context of budgetary, human resources, and cultural considerations in the design of local substance abuse screening programs.

## **Conclusions:**

In our study of RTA drivers presenting within 24 hours of injury, we found relatively low rates of positive BAC and UDS testing. In contrast, using verbal screening questionnaires, we found that nearly a quarter of our population was medium to high risk for an alcohol use disorder. Optimal methods to identify patients in the ED at risk for driving under the influence may include a combination of laboratory and verbal screening.

## Abbreviations

ASSIST

Alcohol, Smoking, and Substance Involvement Screening Test

BAC

Blood alcohol content

ED

Emergency Department

IQR

Inter-quartile range

LMICs

Low- and middle-income countries

MNH

Muhimbili National Hospital

PCP

Phencyclidine

RTA

Road traffic accident

THC

Tetrahydrocannabinol

UDS

Urine drug screen

## Declarations

## Ethics approval and consent to participate

The Institutional Review Board of Muhimbili National Hospital approved the study.

## Consent for publication

Not applicable

## Availability of data and materials

The dataset analyzed during the current study is available from the author on reasonable request.

## Competing interests

The authors declare that they have no competing interests.

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The study was funded with internal funds from the Emergency Medicine Association of Tanzania, a nonprofit organization whose aim is to “pioneer, promote and advocate for the development of emergency medicine in Tanzania.” Research funds were also allocated from the institution of two authors (AD, MR).

## Author’s contributions

AD authored the manuscript and conducted data analysis

AD, EN, HS, JM and MR participated in study ideation and concept design

PN trained generated and was responsible for monitoring of the Redcap database. She also trained research assistants, and assisted with translation of the ASSIST from English into Swahili.

All authors participated in revision and editing of the manuscript.

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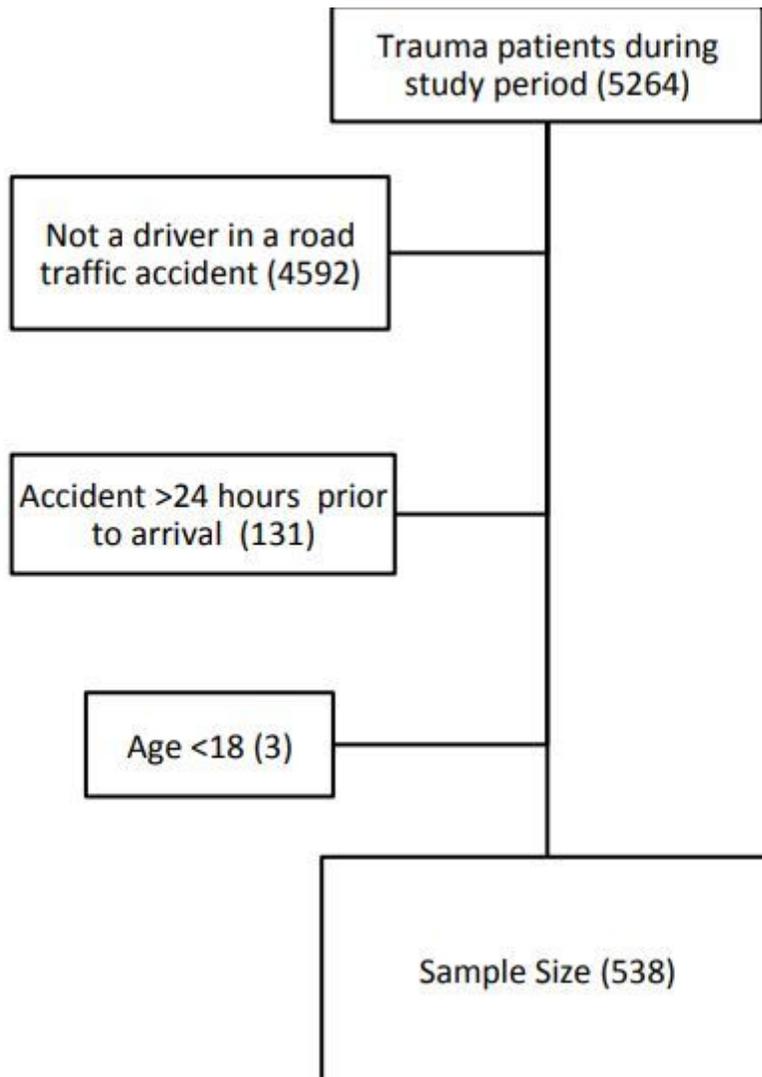
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## Figures



**Figure 1**

Study Flowchart Figure 1 Legend: 5264 trauma patients presented to the Emergency Department during the study period, of which 4592 were excluded because they were not a driver in a road traffic accident. We excluded an additional 131 patients because they arrived more than 24 hours after the accident (131 patients), and 3 patients who were younger than 18 years old. Our final population was 538 patients.