

**Sociodemographic Factors Influencing Disparities in Prevalence of Alcohol-Related Injury among Underserved Trauma Patients in a Suburban Safety-Net Hospital.**

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## **Sociodemographic Factors Influencing Disparities in Prevalence of Alcohol-Related Injury among Underserved Trauma Patients in a Suburban Safety-Net Hospital.**

### **ABSTRACT.**

**Background:** Alcohol-related trauma remains high among underserved patients despite ongoing preventive measures and intervention. Geographic variability in prevalence of alcohol-related injury has prompted calls for reexamination of this burden across different regions. We sought to elucidate sociodemographic factors influencing the prevalence of alcohol-related trauma, and determine effects of alcohol on selected outcomes among underserved patients.

**Methods:** A retrospective cohort analysis using blood alcohol concentration (BAC) compared sociodemographic and clinical variables of trauma patients admitted in 2013 to a suburban safety-net Trauma Center.

**Results:** One third of 738 patients analyzed were BAC-positive, mean (SD) BAC was 211.4 (118.9) mg/dL, 80% of BAC-positive patients had levels  $\geq 100$  mg/dL. After risk adjustments, the following patient characteristics were predictive of having highly elevated BAC ( $\geq 200$  mg/dL) upon admission to the Trauma Center; Hispanic patients (adjusted odds ratio (OR) = 1.91, 95% confidence interval (CI): 1.14 - 3.21), unemployment (OR = 1.74, 95% CI: 1.09 - 2.78), Medicaid beneficiaries (OR = 3.59, 95% CI: 1.96 - 6.59), and uninsured patients (OR = 2.86, 95% CI: 1.60 - 5.13). Patients with BAC of 100 – 199 mg/dL were likely to be more severely injured ( $P = 0.016$ ) compared to undetectable-BAC patients. There was no association between being intoxicated, and being ICU-admitted or having differences in length of ICU or hospital stay.

**Conclusion:** Sociodemographic factors underlie disparities in the prevalence of alcohol-related trauma among underserved patients. These findings may guide targeted interventions toward specific populations to help reduce the burden of alcohol-related injury.

**Key words;** Alcohol-related trauma; Underserved patients; Socio-demographic factors; injury; socioeconomic status; Targeted Interventions; Targeted Preventive Strategies; Blood Alcohol Concentration; Safety-net Hospitals; Alcoholism.

## **Introduction**

Alcohol consumption is well documented to be the most common contributory factor to injury occurrence [1–6]. The U.S. Alcohol Epidemiologic Data shows that 21% of all alcohol-related emergency room (ER) visits are trauma-related, and that 17% of all alcohol-related hospitalisations have an injury-related diagnosis [7, 8]. Studies have shown that there is a high prevalence of alcohol-dependence diagnosis among patients treated at safety-net hospitals [9, 10]. In fact, alcohol-related diagnoses ranks among the top 10 comorbidities identified in patients treated at safety-net hospitals, in contradistinction to patients treated at non-safety-net hospitals [9]. Safety-net hospitals are medical facilities which provide care to a disproportionately high number of disadvantaged patients, including the uninsured, low-income underinsured, Medicaid beneficiaries, and patients with special needs [11, 12].

Studies addressing alcohol misuse in underserved trauma patients are scant, and risk profiles of alcohol intoxicated injured victims are not well characterized [13, 14]. Thus, the continued prevalent use of alcohol among disadvantaged populations, raise questions of effectiveness of current preventive strategies in reducing alcohol-related injuries in underserved regions [15]. The variability in the prevalence of alcohol-related trauma across regions demonstrated by different studies calls for continued small case-series investigations in a greater number of geographic areas [13, 16]. Regional studies present unique advantages, some of which include; the potential to enhance treatment decisions for specific patient groups, the locally based knowledge serving as a means of estimating generalizability of larger population studies, and smaller studies being able to focus on single mechanisms or discrete patient populations [13]. The purpose of this study was to examine the sociodemographic characteristics associated with

alcohol-related trauma among patients from an underserved multi-ethnic suburban environment, and determine the influence of alcohol on outcome in patients admitted to a safety-net hospital.

The study was approved by “*the study hospital’s*” Institutional Review Board Committee.

## Methods

A retrospective cohort analysis was performed on patients admitted with traumatic injuries for the period of January, 2013 through December, 2013 to “*the study hospital*”. The hospital is a 500 bed tertiary care Level I Trauma Center, and functions as the County’s public safety-net hospital [17]. A great majority of patients treated at “*the study hospital*” are uninsured or low-income underinsured individuals, minorities, undocumented patients, and people with special health care needs [17].

### *Study population and outcome measures.*

The study cohort consisted of patients aged 15 – 70 years, who were admitted within 6 hours of injury. Diagnoses of traumatic injuries were defined by ICD-9-CM external injury codes E800-995, based on the final diagnoses at the time of discharge. As part of standard trauma evaluation, nearly all adult patients presenting to the ER with traumatic injuries requiring trauma team activation have their blood drawn for blood alcohol concentration (BAC) measurement. Only patients who had blood drawn for BAC were included. Information abstracted included age, gender, ethnicity, employment status, insurance type, injury mechanism, and selected measures of severity, i.e., Glasgow Coma Score (GCS), and Injury Severity Score (ISS). Patient or family self-reporting was used to determine ethnicity (White, African-American/Black, Hispanic/Latino, Asian, Other), which was abstracted from admission forms. Insurance and

employment status were selected as indicators of a patient's socioeconomic status (SES) [10]. Patients' GCS, which assess degree of neurologic impairment from brain injury, were stratified in the usual standard fashion into GCS of 13 – 15, 9 – 12, and 3 – 9 to represent mild, moderate, and severe traumatic brain injury respectively [18]. The ISS, which is a validated anatomical scoring system, that assigns an aggregate score of overall injury severity of a patient, was stratified as low severity = ISS 1 – 8, medium severity = ISS 9 – 14, and high severity = ISS 16 – 75 injury, following accepted recommendations [19]. Intensive Care Unit admission (ICUADMIT), ICU length of stay (ICULOS) and hospital LOS (HLOS) in days, as well as ISS were selected as outcomes of interest.

A patient's BAC status, based on measurements in mg/dL, was categorized as a binary variable into either having an undetectable BAC or having a BAC-positive status. Further categorization based on level was into  $BAC < 1\text{mg/dL}$  representing undetectable BAC, and then  $BAC \geq 1\text{mg/dL}$  to  $< 100\text{mg/dL}$ ,  $BAC \geq 100\text{mg/dL}$  to  $< 200\text{mg/dL}$ , and  $BAC \geq 200\text{mg/dL}$  to represent categories of being BAC-positive. Patient's with  $BAC \geq 100\text{ mg/dL}$  were considered intoxicated based on recommendations from the Surgeon General's Workshop on Drunk Driving, as a level consistent with the likelihood of being involved in a crash [20].

Excluded from the study were patients admitted after more than 6 hours following injury, patients who died, were discharged, or transferred out to another facility, within 24 hours of admission, and patients who had prolonged HLOS  $> 40$  days. This was done in order to ensure a more accurate BAC at time of injury and to limit distortion of length of stay results [3]. Patients with factors known to confound GCS assessment, such as intoxication with other substances, pre-existing seizure disorders causing the traumatic event, pre-existing schizoaffective disorders mimicking altered mental status, and patients with moderate and severe TBI prior to index

injury, were also excluded. Finally, patients with mechanisms not reflective of common injuries in our trauma registry, such as, drownings, burns, and electrocutions, which all together constituted < 1% of injury mechanisms in the registry were excluded.

#### *Statistical analysis.*

Descriptive statistics were calculated by BAC status (i.e., positive or undetectable). Pearson  $\chi^2$  test for categorical variables, and T-test for continuous variables were used to evaluate statistical differences between both cohorts. Final statistical analyses consisted of estimating a series of regressions after risk adjustments, first to isolate sociodemographic factors predictive of having elevated positive BAC status upon admission, and secondly to isolate the influence of a positive BAC on outcomes of interest. Prior knowledge of well described modifiers of trauma outcomes determined covariates included in final models [21, 22]. Patients' ISS, ICULOS and HLOS in hours – after conversion from days – were analyzed using linear regression models, while ICUADMIT, and predictors of BAC-positive status were examined using logistic regressions. A *P*-value < 0.05 was accepted as level of significance. All analyses were performed using SAS software (SAS Institute Inc., Cary, N.C.).

#### RESULTS:

During the one year study period, 1182 patients aged  $\geq 15$  years were admitted to the trauma service, out of whom 885 patients aged 15 – 70 years were evaluated for inclusion. The final cohort consisted of 738 patients. Sociodemographic variables by BAC distribution are presented in Table 1. More than one third (34.3%, *n* = 253) of all patients were BAC-positive. The highest BAC was 577 mg/dL, mean BAC was  $211.4 \pm 118.9$  mg/dL, and 80% of all BAC-

positive patients were clinically intoxicated ( $BAC \geq 100$  mg/dL). A significantly higher proportion ( $P < 0.001$ ) of BAC-positive patients were male (85.8%,  $n = 217$ ) compared to the proportion of BAC-positive who were female (14.2%,  $n = 36$ ). Mean age for the entire study sample was 38.2 years. The age distribution between patients who were BAC-positive and those with undetectable BAC were similar. Age category 21 – 30 years (26.4%,  $n = 195$ ) was the most frequent age among all patients, and there was no difference in frequency ( $P = 0.13$ ) in this age category between both cohorts. There was a significantly higher representation ( $P < 0.05$ ) of Hispanic patients (25.7%), unemployed patients (58.5%), uninsured patients (19.4%), and Medicaid beneficiaries (20.95) among BAC-positive cohorts compared to the proportion of their corresponding counterparts among undetectable-BAC patients (17.1%, 50.5%, 12.2% and 9.5% respectively).

Estimates of sociodemographic variables predictive of having a positive BAC status upon admission, in adjusted odds ratio (OR), 95% confidence interval (CI) is shown in Table 2. Male patients (OR = 0.20, 95% CI: 0.11 - 0.38), Hispanic patients (OR = 1.91, 95% CI: 1.14 - 3.21), unemployment (OR = 1.74, 95% CI: 1.09 - 2.78), Medicaid beneficiaries (OR = 3.59, 95% CI: 1.96 - 6.59), and uninsured patients (OR = 2.86, 95% CI: 1.60 - 5.13), were all predictors of having highly elevated ( $\geq 200$ mg/dL) BAC upon admission.

Injury mechanisms, as well as, severity and outcome measures in mean (standard deviation) by BAC status are reported in Table 3. Significantly fewer percentage ( $P < 0.05$ ) of BAC-positive patients (29.3%,  $n = 74$ ) were involved in motor vehicle crashes (MVC), compared to undetectable-BAC patients (44.3%,  $n = 215$ ). Statistical difference between cohorts with MVC mechanism was lost, when patients were categorized as either being driver or



passenger of the vehicle. There was no difference ( $P = 0.11$ ) in falls as a mechanism between both cohorts, however, when separated into fall from “ground-level” versus fall from “non-ground level (fall from height)”, there were significantly more ( $P < 0.001$ ) ground level-fall victims among BAC-positive patients (58.1%,  $n = 36$ ) than among undetectable-BAC patients (19.2%,  $n = 18$ ). Twenty five percent of BAC-positive patients sustained violence-related injuries (i.e. stabbings, gunshot wounds and assaults), compared to 9.5% of undetectable-BAC patients with violence-related injuries ( $P < 0.001$ ). Even when each type of violence-related mechanisms was isolated, significant difference between both BAC cohorts was maintained, except for gunshot wound victims.

Severity and outcome measures shows that positive-BAC patients had significantly higher ( $P < 0.001$ ) mean (SD) ISS of 8.7 (8.0), and lower mean (SD) GCS of 13.70 (2.85), compared to undetectable-BAC patients, who had mean (SD) ISS of 6.69 (6.35) and mean (SD) GCS of 14.87 (0.84) respectively. A significantly higher proportion ( $P = 0.001$ ) of BAC-positive patients were admitted to the ICU (31.2%,  $n = 79$ ), compared to the proportion of undetectable BAC patients (20.4%,  $n = 99$ ) admitted to the ICU. Patients with positive BAC also had a longer ( $P < 0.05$ ) mean (SD) ICU LOS of 1.07 (2.96) days, compared to undetectable-BAC cohorts with mean (SD) ICU LOS of 0.59 (1.94) days. There was no difference ( $P = 0.24$ ) in mean (SD) HLOS between both BAC status cohorts (i.e., 4.04 (8.13) days for BAC-positive patients, and 3.49 (4.47) days for undetectable BAC patients).

Risk adjusted regression estimates of outcomes are shown in Table 4. The regression analysis for ISS (Model 1) shows that patients with BAC of 100 – 199 mg/dL were associated with having an ISS that was at least 2 points higher ( $P = 0.016$ ) than the ISS of undetectable

BAC patients. There was no association of any BAC-positive category with being admitted to the ICU, or having a significant difference in length of stay, either in the ICU or hospital (Table 4, Models 2 – 4).

## **Discussion**

Determinants of alcohol-related harm are said to be linked to local environmental factors, local drinking patterns, and volume of alcohol consumed per region [8]. Demographic characteristics of a community are, in-turn, said to influence drinking patterns. The percentage of admitted trauma patients with positive BAC in this study (34.3%) was twice the national average of 17% of hospitalized patients with alcohol-related injury diagnoses [7]. This reflects a high level of harmful drinking patterns, and drinking culture among patients from the local underserved suburban community [13]. The detrimental drinking patterns among patients in this study is also reflected by the high mean BAC, and the high percentage (80%) of intoxicated patients ( $\text{BAC} \geq 100\text{mg/dL}$ ), which exceed ratios seen in prior studies [23, 24]. These levels are comparable to those reported in studies predating the widespread adoption of brief intervention (BI) for alcohol in trauma patients [5, 25, 26]. The proportion of BAC-positive patients, in this study, who were involved in MVCs was also higher than the national average of 20.1% of alcohol-related motor vehicle crashes [7]. These results confirm the thesis of regional variability in prevalence of alcohol-related trauma highlighted in a WHO report which showed that in the US, percentages of injured victims with positive BAC ranged from 6% to 23% depending on the region of study, even varying between different populations within the same region [13].

The sociodemographic disparities in percentage of BAC-positive patients identified in this study, particularly among patients with highly elevated BAC ( $\geq 200\text{mg/dL}$ ), suggests that

there are gaps in current preventive measures which need to be addressed [27]. Indeed, Hispanic patients, who constituted a substantial portion (20%) of this study population, accounted for one in four of BAC-positive patients, and demonstrated a disproportionately high representation among BAC-positive cohorts than among undetectable BAC patients. Also, Hispanic patients were associated with having highly elevated BAC upon admission. Similarly, patients with sociodemographic characteristics suggestive of being of a lower SES, such as, being unemployed, uninsured, or a Medicaid beneficiary, demonstrated disproportionately higher representation among BAC-positive patients than among undetectable BAC patients. In addition, they were all associated with having highly elevated BAC upon admission. These findings support theories of increased vulnerability of patients of poor SES to the consequences of alcohol consumption [8].

Our results argue strongly for more encompassing preventive strategies that recognizes the different populations significantly impacting the overall prevalence of alcohol-related trauma. Current strategies need to be modified to include targeted programs towards known risk groups. Indeed, our finding that BAC-positive patients were predominantly adult males under the age of 30 years is consistent with data from previous studies which show similar over-representation of young males among BAC-positive trauma patients [3, 7, 23, 28, 29]. Also, violence-related injuries being more frequent among BAC-positive patients, has been a common finding demonstrated in several previous studies [29–31]. Our demonstration of Hispanic patients and lower SES individuals being more represented among BAC positive cohorts than undetectable BAC cohorts, further suggests that preventive strategies may be more effective if directed at, or adapted for specific populations known to be at great risks of sustaining alcohol-related injuries within a region [32]. Effective interventions in this population present a major

opportunity to reduce alcohol-related injury burden in the general population. Indeed the efficacy of Brief Interventions (BI) among disadvantaged patients has been questioned [33, 34]. A recent review of research on effectiveness of alcohol BI, revealed that the impact of SES on BI remained unclear mainly because most available studies had limited their focus on the role of SES on success of interventions [34]. Disadvantaged patients may not be motivated to follow through with routine referrals to alcohol counselling or rehabilitation after they have been discharged from the hospital, especially if such programs are associated with out-of-pocket expenses [35]. Studies focused on addressing socioeconomic gaps in brief intervention and referral programs are needed. Education for trauma staff on issues related to substance use also needs to be culturally competent. Disadvantaged patients could be linked to alcohol nurse specialists who would provide adequate outreach efforts, and help motivate them to continue with interventions.

Our results demonstrating that worsened injury severity was restricted to patients with BAC of 100mg/dL to 199mg/dL, compared to undetectable BAC patients, highlights the complex relationship between alcohol intoxication and trauma outcome. These findings add to the body of evidence which shows that having a positive BAC in and of itself may not be sufficient impact trauma outcomes but that injury outcome may be related to other factors such as chronic alcoholism, as well as level of intoxication at the time of injury [26]. The restriction of this association of injury severity to a specific BAC range may be related to the continuum of effect that alcohol has on the central nervous system; from initial disinhibition to a subsequent neurologic depressant effect [36]. When considered with results of descriptive statistics showing that more BAC-positive patients were admitted to the ICU, had higher mean ISS and lower mean GCS, it becomes clear that some BAC-positive patients may not have been admitted if they had

not been intoxicated. These results are consistent with findings from previous studies demonstrating that although alcohol-related injured patients may be assessed to have more severe injuries, this does not necessarily translate to worsened trauma outcomes [26].

An inherent limitation of this being a retrospective study is that data which could not be obtained may have affected findings. For example a patient's use of other drugs may have contributed to degree of intoxication, and thus affected outcome [37, 38]. Although patients who were detected to have used other drugs were excluded, the number of these patients identified depended on the proportion of patients tested for other substances at the time of admission. Excluding patients who presented more than 6 hours after injury from the study may have underestimated the percentage of alcohol-related injuries among our trauma patient population, and excluding patients with prolonged hospital stay may have impacted LOS results. Many studies relying on measured BAC for analysis, restrict the study population to patients arriving the ED within six hours following injury, in order to provide a more accurate BAC measurement [3]. These results reflect prevalence from a single institution, larger studies incorporating several safety-net trauma centers are needed to elucidate factors influencing disparities in alcohol-related trauma prevalence in underserved patients.

Alcohol use among underserved trauma patients continues to be a significant problem despite ongoing measures to prevent alcohol-related trauma. Our findings raise concerns about the efficacy of current preventive strategies among disadvantaged individuals. These results argue strongly for targeted interventions towards specific populations in addition to the current measures in place. Findings in this study may help guide population-specific prevention programs, which needs to be addressed in future work.

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**\*Conflict of Interest Statement**

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None of the authors have any conflict of interest to declare or have any financial and personal relationships with other people or organisations that could inappropriately influence (bias) their work.

Sincerely,

A handwritten signature in black ink, appearing to be 'Ikenna Nweze', written over a horizontal line.

**Ikenna Nweze, MD**

## Tables

**Table 1. Socio-demographic Characteristics by BAC Distribution of Admitted Trauma Patients in 2013 at NUMC, Long Island NY.**

Characteristics	Total Population No. (%)	Positive BAC No. (%)	Undetectable BAC No. (%)	P – Value*
Hospitalized Patients	738 (100)	253 (34.3)	485 (65.6)	
Gender				
Male	527 (71.4)	217 (85.8)	310 (63.9)	< 0.001
Female	211 (28.6)	36 (14.2)	175 (36.1)	
Age - yrs.				
Mean [SD]	38.2 [14.8]	37.6 [14.1]	38.5 [15.1]	0.415
15 – 20	89 (12.1)	25 (9.9)	64 (13.2)	0.233
21 – 30	195 (26.4)	76 (30.0)	119 (24.5)	0.128
31 – 40	138 (18.7)	50 (19.8)	88 (18.1)	0.663
41 – 50	124 (16.8)	41 (16.2)	83 (17.1)	0.834
51 – 60	132 (17.9)	46 (18.2)	86 (17.7)	0.960
61 – 70	60 (8.1)	15 (5.9)	45 (9.3)	0.150
Race/Ethnicity				
Asian	25 (3.4)	5 (2.0)	20 (4.1)	0.126
Black	136 (18.4)	39 (15.4)	97 (20.0)	0.127
Hispanic	148 (20.1)	65 (25.7)	83 (17.1)	0.006
White	407 (55.1)	140 (55.3)	267 (55.1)	0.106
Other	22 (4)	4 (1.6)	18 (3.7)	0.941
Employment Status				
Employed	299 (40.5)	90 (35.6)	209 (43.1)	0.048
Retired	23 (3.1)	7 (2.8)	16 (3.3)	0.693
Student	23 (3.1)	8 (3.2)	15 (3.1)	0.959
Unemployed	393 (53.3)	148 (58.5)	245 (50.5)	0.039
Insurance Type				
No Fault	323 (42.8)	80 (31.6)	243 (50.1)	< 0.001
Commercial	117 (15.9)	49 (19.4)	68 (14.0)	0.060
Uninsured - Self-pay	108 (14.6)	49 (19.4)	59 (12.2)	0.009
Medicaid	99 (13.4)	53 (20.9)	46 (9.5)	< 0.001
Medicare	37 (5)	15 (5.9)	22 (4.5)	0.410
Workers Comp.	42 (5.7)	2 (0.8)	40 (8.2)	< 0.001
Other	12 (1.6)	5 (2.0)	7 (1.4)	0.59
BAC Level - mg/dL				
Mean [SD]		211.4 [118.9]		
BAC 1 – 99 mg/dL		49 (19.4)		
BAC 100 – 199 mg/dL		67 (26.5)		
BAC ≥ 200 mg/dL		137 (54.2)		

Abbreviations: BAC, Blood Alcohol Concentration; SD, Standard Deviation; Workers Comp., Workers Compensation. \*P < 0.05 indicates significant differences in distribution between BAC-positive and Undetectable-BAC patients.

Table 2. Adjusted Odds Ratio of Sociodemographic Predictors of Being BAC-positive upon Admission to NUMC, Long Island NY in 2013.

Characteristics	BAC 1 – 99 mg/dL			BAC 100 – 199 mg/dL			BAC 200 – 299 mg/dL		
	OR	95% CI	P - value	OR	95% CI	P - value	OR	95% CI	P - value
Female gender <sup>1</sup>	0.53	(0.25, 1.12)	0.097	0.39	(0.20, 0.77)	<b>0.007</b>	0.20	(0.11, 0.38)	<b>&lt; 0.001</b>
Age	0.99	(0.96, 1.01)	0.252	0.99	(0.97, 1.01)	0.240	1.01	(1.00, 1.03)	0.118
Race <sup>2</sup>									
Hispanic	0.71	(0.29, 1.78)	0.467	0.57	(0.24, 1.34)	0.195	1.91	(1.14, 3.21)	<b>0.014</b>
Black	1.07	(0.51, 2.24)	0.863	0.64	(0.30, 1.34)	0.235	0.46	(0.24, 0.90)	<b>0.024</b>
Asian	NE			0.58	(0.12, 2.85)	0.504	0.86	(0.23, 3.19)	0.819
Other	NE			1.16	(0.31, 4.31)	0.828	0.20	(0.03, 1.63)	0.133
Employment <sup>3</sup>									
Unemployed	0.99	(0.52, 1.89)	0.977	0.91	(0.51, 1.63)	0.759	1.74	(1.09, 2.78)	0.020
Student	0.42	(0.05, 3.64)	0.433	1.03	(0.26, 4.17)	0.963	1.84	(0.53, 6.41)	0.341
Retired	NE			1.57	(0.42, 5.84)	0.499	0.66	(0.17, 2.62)	0.554
Insurance Type <sup>4</sup>									
Commercial	3.05	(1.36, 6.87)	<b>0.007</b>	1.61	(0.77, 3.35)	0.202	1.74	(0.90, 3.38)	0.103
Medicare	N.E.			1.83	(0.56, 5.96)	0.315	1.97	(0.79, 4.94)	0.148
Medicaid	2.23	(0.86, 5.78)	0.099	1.88	(0.82, 4.31)	0.136	3.59	(1.96, 6.59)	<b>&lt; 0.001</b>
Uninsured	2.08	(0.86, 5.04)	0.106	0.81	(0.31, 2.11)	0.659	2.86	(1.60, 5.13)	<b>&lt; 0.001</b>
Workers-Comp <sup>5</sup>	0.29	(0.04, 2.35)	0.246	0.18	(0.02, 1.41)	0.103	NE		
Others	NE			7.04	(1.94, 25.33)	<b>0.003</b>	NE		

Abbreviations: BAC, Blood Alcohol Concentration; OR, Odds Ratio; CI, Confidence Interval; NE, Not Estimable; Workers-Comp, Workers Compensation. Significant associations ( $P < 0.05$ ) are in bold print. 1. Negative factor changes for regression coefficients illustrate directional impact. 2. Zero (undetectable) BAC was the base group. 3. Male was the base group. 4. Base group was accidental hit to head

Table 3. Injury Mechanism, Severity and Outcome Measures by BAC Status of Patients Admitted to NUMC, Long Island NY in 2013.

Variables	Total Population		Positive BAC		Undetectable BAC		P – Value*
	No.	(%)	No.	(%)	No.	(%)	
Injury Mechanism							
Motor Vehicle Crash	289	(39.2)	74	(29.3)	215	(44.3)	< 0.001
Driver	221	(76.4)	58	(78.4)	163	(75.7)	0.64
Passenger	68	(23.6)	16	(21.6)	52	(24.3)	
Motorcycle Crash	44	(6.0)	13	(5.1)	31	(6.4)	0.50
Bicycle Crash/Falls	14	(1.9)	5	(2.0)	9	(1.9)	0.94
Pedestrian Struck	92	(12.5)	28	(11.1)	64	(13.2)	0.41
Falls	156	(21.1)	62	(24.5)	94	(19.4)	0.11
Ground Level	54	(34.6)	36	(58.1)	18	(19.2)	< 0.001
Non-Ground Level	102	(65.4)	26	(41.9)	76	(80.9)	
Violence-Related	108	(14.6)	62	(57.4)	46	(42.6)	< 0.001
Assault	40	(5.4)	27	(10.7)	13	(2.7)	< 0.001
Gunshot Wound	20	(2.7)	9	(3.6)	11	(2.3)	0.31
Stab Wound	40	(5.4)	20	(7.9)	20	(4.1)	0.03
Fight/Brawl	8	(1.1)	6	(2.4)	2	(0.4)	0.02
Unintentionally Struck by Object	14	(1.9)	1	(0.4)	13	(2.7)	0.03
Crush Injury	4	(0.5)	0		4	(0.8)	0.15
Lacerations	11	(1.5)	5	(2.0)	6	(1.2)	0.43
Miscellaneous <sup>1</sup>	6	(0.8)	3	(1.2)	3	(0.6)	0.42
ISS in mean [SD]	7.37	[7.01]	8.67	(7.99)	6.69	[6.35]	< 0.001
1 – 8	498	(67.5)	150	(59.3)	348	(71.8)	
9 – 14	151	(20.5)	63	(24.9)	88	(18.1)	
16 – 75	89	(12.1)	40	(15.8)	49	(10.1)	0.024
GCS in mean [SD]	14.47	[1.88]	13.70	[2.85]	14.87	[0.84]	< 0.001
13 – 15	700	(94.9)	220	(87.0)	480	(98.9)	
9 – 12	15	(2.0)	13	(5.1)	2	(0.41)	
3 – 8	23	(3.1)	20	(7.9)	3	(0.16)	< 0.001
ICU Admissions	178	(24.1)	79	(31.2)	99	(20.4)	0.001
ICU LOS: mean [SD] days	0.75	[2.35]	1.07	[2.96]	0.59	[1.94]	0.009
Hospital LOS: mean [SD] days	3.68	[5.98]	4.04	[8.13]	3.49	[4.47]	0.235

Abbreviations: BAC, Blood Alcohol Concentration; SD; Standard Deviation; GCS, Glasgow Coma Score; ISS, Injury Severity Score; ICU, Intensive Care Unit. *P* < 0.05 indicates significant differences between BAC-positive and undetectable-BAC patients. 1. Miscellaneous = car surfing, impalement, hanging, strangulations, boating injuries, sport/exercise injuries and diving accidents.

Table 4. Regression Estimates of Association of BAC with Severity and Outcome Measures of Hospitalized Trauma Patients at NUMC, Long Island NY in 2013.

DEPENDENT VARIABLE	Injury Severity Score		Admission to ICU		ICU length of stay in hours		Hospital length of stay in hours		
	Parameter Estimate <sup>1</sup>	P - value	Odds Ratio	(95% C.I.)	P - value	Parameter Estimate <sup>1</sup>	P - value	Parameter Estimate <sup>1</sup>	P - value
Adjusted Models	(1)		(2)		(3)		(4)		
BAC Categories <sup>2</sup>									
BAC 1 – 99 mg/dL	1.05	0.274	1.54	(0.70, 3.42)	0.286	7.36	0.329	8.33	0.661
BAC 100 – 199 mg/dL	1.99	0.016	0.52	(0.22, 1.24)	0.138	- 0.61	0.925	- 8.50	0.258
BAC ≥ 200 mg/dL	- 0.62	0.359	0.85	(0.47, 1.55)	0.596	- 3.89	0.463	- 9.00	0.155
Age	0.04	0.018	0.97	(0.96, 0.99)	< 0.001	- 0.04	0.731	0.47	0.151
Female <sup>3</sup>	- 0.12	0.827	1.36	(0.83, 2.23)	0.228	- 3.66	0.388	- 5.90	0.581
GCS	- 1.50	< 0.001	0.66	(0.54, 0.81)	< 0.001	- 3.41	0.003	- 6.89	0.017
ISS	NA		1.20	(1.15, 1.24)	< 0.001	3.70	< 0.001	9.65	< 0.001
Injury Mechanism <sup>4</sup>									
Assault	- 1.89	0.334	0.99	(0.22, 4.43)	0.987	- 0.22	0.99	5.78	0.881
Bicycle Crash	2.14	0.355	1.93	(0.34, 10.93)	0.460	- 1.99	0.91	4.42	0.923
MVC	- 1.61	0.345	0.36	(0.10, 1.31)	0.120	1.78	0.89	33.35	0.323
Fall	- 1.33	0.447	0.75	(0.20, 2.83)	0.675	8.02	0.56	46.63	0.177
Pedestrian	2.37	0.188	0.62	(0.16, 2.47)	0.503	5.51	0.70	60.57	0.089
Stabbing	- 0.86	0.660	2.01	(0.45, 8.29)	0.375	17.63	0.25	62.75	0.102
MCC	3.09	0.106	0.31	(0.07, 1.40)	0.127	9.09	0.54	41.66	0.270
Fight/Brawl	- 4.34	0.120	0.20	(0.01, 2.72)	0.224	- 12.22	0.58	- 23.95	0.663
GSW	- 0.38	0.860	0.46	(0.07, 2.82)	0.401	3.19	0.85	30.51	0.478
Laceration	- 3.29	0.190	0.39	(0.04, 4.18)	0.434	3.51	0.86	56.37	0.256
Miscellaneous <sup>5</sup>	- 2.69	0.296	1.35	(0.21, 8.84)	0.753	3.43	0.87	30.12	0.554

Abbreviations; C.I., Confidence Interval of estimates; GCS, Glasgow Coma Score, GSW, Gunshot Wound; ISS, Injury Severity Score; MCC, Motorcycle Crash; MVC, Motor Vehicle Crash; NA, Not Applicable. Significant associations are in bold print. 1. Negative factor changes for regression coefficients illustrate directional impact. 2. <1mg/dL (Undetectable BAC) BAC was the base group. 3. Male was the base group. 4. Unintentionally struck by object was base group. 5. Miscellaneous = car surfing, impalement, hanging, strangulations, boating injuries, sport/exercise injuries and diving accidents.