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ORIGINAL ARTICLE

Alcohol Brand Use and Injury in the Emergency Department: A Pilot Study

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In an urban emergency department on weekend nights in 2010 and 2011, 105 interviews assessed feasibility of collecting alcohol brand consumption data from injured patients who drank within 6 h of presentation, with responses to the orally administered survey specifying 331 alcohol brands recorded on a netbook computer. A Kruskal–Wallis test adjusted for tied ranks assessed demographic differences; confidence intervals were created around comparisons with national brand shares. The study found collection of such information feasible; limitations include comparison of national brand market share data with a local sample of drinkers. Funding was provided by the Centers for Disease Control and Prevention.

Keywords alcoholic beverage type, alcoholic energy drinks, injury, emergency department

INTRODUCTION AND AIMS

Alcohol use causes 80,000 deaths per year in the United States (Centers for Disease Control and Prevention, 2012a) and is associated with the three leading causes of death of persons between the ages of 1 and 40: unintentional injury, suicide, and homicide (Centers for Disease Control and Prevention, 2012b). The study of alcohol-related injury in emergency departments is well established, and the World Health Organization recently published the results of the application of standardized methodologies for studying alcohol-related emergency visits in 12 countries around the world (World Health Organization, 2007). Numerous studies have established the prevalence of alcohol-related injuries in emergency department populations. The most recent review of the literature yielded an aggregate, weighted estimate that 32.5% of injury visits to Level I trauma centers were alcohol-related (MacLeod & Hungerford, 2010). Another recent study explored the pattern of drinking that is most likely to precede presentation at an emergency department with an alcohol-related injury, finding that episodic heavy and frequent heavy drinking were the two most likely patterns. This study also concluded that countries with stronger alcohol policies had lower levels of alcohol-related injury in their emergency departments (Cherpitel et al., 2012).

Another element of pattern of drinking is what beverages were consumed prior to an alcohol-related injury that led to presentation in the emergency department. Particular beverages may entail higher risks for injury than others. In the United States, the category of caffeinated flavored malt beverages, or "alcoholic energy drinks," showed this kind of risk in recent years (O'Brien, McCoy, Rhodes, Wagoner, & Wolfson, 2008; Weldy, 2010; Cleary, Levine, & Hoffman, 2012). To explore further the level of risk posed by these products, including by specific brands of such products, we began a pilot study to see if we could collect data on what brands of alcohol, including but not limited to alcoholic energy drinks, injured persons were drinking prior to presenting at the emergency department. There has been no prior publication of studies pursuing this line of research in the emergency department, to our knowledge; indeed, some have argued that alcohol brand research is prohibitively expensive (Federal Trade Commission, 1999).

As a pilot study, we had two specific aims: (1) to assess the feasibility of collecting alcohol brand consumption information from patients reporting to the emergency department with injury; (2) to assess the distribution of alcohol beverage brands and types consumed by emergency department patients and to contrast this with national data on alcohol brand and type market shares.

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DESIGN AND METHODS

Study Population

The study was conducted in an urban medical center emergency department, the Johns Hopkins Hospital Emergency Department in East Baltimore. The majority (74.5%) of the patients presenting at this ED come from Baltimore's largely African American (74.4%) (Li, Grabowski, McCarthy, & Kelen, 2003) inner city neighborhoods that surround the hospital (data from Johns Hopkins Department of Emergency Medicine, 2011). The catchment area is made up of approximately 714 census blocks and 42,278 adult residents where 32.1% of housing units are owner-occupied, 45.4% renter-occupied, and 22.5% are vacant (Li et al., 2003).

Procedures

Data were collected on Friday and Saturday nights (because Americans tend to consume more alcohol on the weekends (Haines, Hama, Guilkey, & Popkin, 2003) and because alcohol is most frequently detected in persons fatally injured on the weekend (Smith et al., 1989) from April 2010 to June 2011 by the lead author and three research assistants, usually working in teams of two. The research team was granted access to the emergency department's intake database. Because the emergency department did not use ICD codes, we used a list of all injury conditions in the intake database to identify persons age 18 and above presenting with injury, and excluded persons in the following categories from the survey: those with life threatening injury with hemodynamic or neurological instability, those unable to speak English, and those in police custody.

The emergency department's intake interview included a question regarding whether the patient drinks alcohol (not specific to that injury event but rather in general). If the patient presented with an injury and had an affirmative answer to this question recorded in the intake database, the research team approached the physician responsible and requested the physician to determine whether the patient was sufficiently sober to provide informed consent. When the physician judged informed consent could be provided, the research team approached the patient and requested it. Subsequent to informed consent, the team asked the patient whether he or she had been drinking alcohol prior to injury; those who had not been drinking were excluded from the survey. The team then administered the survey orally, recording answers on a netbook computer. When we approached patients between 18–20 years of age (six cases), parents or guardians were often close by. In these cases, we asked to be alone with the patient to ensure answers were not subject to parental influence. All study procedures were reviewed and approved by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board.

Measures

Basic demographic information (age, gender, highest level of education attained, race) was collected from all survey participants, but no personal identifiers were used. Drop-down menus permitted the research team to ask for specific branded consumption by alcohol category (beer–-including malt liquor; wine or champagne; "ready-to-drink" (RTD) beverages-–including alcoholic energy drinks and flavored malt beverages; bourbon; brandy; cognac; gin; rum; scotch; tequila; vodka; whiskey; cordials and liquors). Using this method, the survey asked about consumption of 331 specific beverages, with space for reporting of other brands as well. Flavored line extensions were collapsed into the larger brand family (e.g., Absolut Apeach, Absolut Mandrin recorded under Absolut Vodka).

The survey asked the quantity of each beverage consumed, by size of the container. It also asked whether respondents had ever mixed energy drinks of any kind with alcohol, and whether they drank a premixed alcoholic energy drink and if so, what brand of this drink they consumed. Respondents were then asked if they considered it dangerous or risky to mix energy drinks with alcohol in relation to injury.

Share of market volume for individual beverages as well as for beverage categories came from Impact Databank, a market research firm that tracks the U.S. market for alcoholic beverages by alcohol type and by brand. We used 2010 national market share data, the most current data available at the time of the study.

Analytic Methods

A Kruskal-Wallis test, adjusted for tied ranks, was used to evaluate differences in ounces of alcoholic beverages consumed within demographic categories (gender, age, race, education) for each beverage type (distilled spirits, beer, RTD, wine). To test for differences between patterns of alcohol consumption in our ER sample versus patterns of consumption in the U.S. market, we created confidence intervals around the proportion of alcohol type consumed within the ER sample to compare to the market share data from Impact Databank.

RESULTS

Feasibility

The research team completed 105 interviews between April 2010 and June 2011. Physicians were cooperative with the research team, whose members were able to collect data with minimal intrusion in the work of the emergency department. While data on refusals were not kept after encountering a substantial number of refusals early on, the research team with permission from the emergency department wore white coats; following this change in study procedure, refusals were rare. Interview length was usually <5 min. Initially the team arrived at the emergency department at 10 p.m.; however, due to the time needed for most drinking patients to become sufficiently sober to give informed consent, the team ultimately arrived at close to 4 a.m. and generally stayed at least 4 h.

TABLE 1. Volume of alcohol consumed by beverage category by demographic

Total $n = 105$	N (%)	Spirits, oz. (%)	Beer[a], oz. (%)	RTD[b], oz. (%)	Wine, oz. (%)
Total ounces		945	2877.4	328	34.2
Gender					
Male	73 (69)	766.6 (81)	2729.4 (95)	112 (34)	16.2 (47)
Female	32 (31)	178.4 (19)	148 (5)	216 (66)	18 (52)
*P-Value***		0.2041	0.0001	0.0117	0.2832
Age, years					
18–24	25 (24)	174.4 (18)	320 (11)	84 (25)	0 (0)
25–34	27 (26)	210.1 (22)	937.4 (33)	124 (38)	8.2 (24)
35–49	27 (26)	295.9 (31)	992 (34)	120 (37)	8.0 (23)
50–89	26 (25)	264.6 (28)	628 (22)	0 (0)	18.0 (53)
*P-Value***		0.4582	0.4080	0.2457	0.3271
Race					
African-American	72 (69)	556.5 (59)	1533.4 (53)	288 (88)	16.2 (47)
White	27 (26)	279.6 (30)	1092 (38)	16 (5)	18.0 (53)
Hispanic	4 (4)	44.9 (5)	168 (6)	0 (0)	0 (0)
American Indian/Alaska native	2 (2)	64 (7)	84 (3)	24 (7)	0 (0)
*P-Value***		0.6467	0.2114	0.1497	0.5428
Education					
< High school	40 (38)	425.6 (45)	860 (30)	84 (26)	0 (0)
Completed high school	36 (34)	271.1 (29)	1284 (45)	156 (48)	10.2 (30)
College	29 (28)	248.3 (26)	733.4 (25)	88 (27)	24.0 (70)
*P-Value***		0.8011	0.8629	0.7102	0.1326

[a]Beer = Beer and malt liquor

[b]RTD = Ready to drink which includes flavored malt beverages (FMB) and alcoholic energy drinks (AED)

***P*-value based on Kruskal–Wallis test

The maximum number of interviews conducted per shift was seven; the lowest number was zero.

Sample Demographics

Of the 105 respondents, 73 (69%) were male, and 72 (69%) were African-American, reflecting the demographic profile of the neighborhood in which the emergency department is located. Most (72%) had not attended college, and 40 (38%) had not completed high school (Table 1).

Consumption by Demographic Group and Injury Type

Females consumed significantly fewer ounces of beer or other malt liquor than males ($\chi^2 = 14.64$, 1 d.f., $P = 0.0001$) and consumed significantly more ounces of RTDs than males ($\chi^2 = 6.357$, 1 d.f., $P = 0.0117$). Females consumed fewer ounces of distilled spirits although this was not significantly different from males ($\chi^2 = 1.613$, 1 df, $P = 0.2041$); other gender-based differences were not significant (Table 1). Among Whites, African-Americans, Hispanics, and American-Indians/Alaska Natives, the total ounces of distilled spirits consumed were not significantly different ($X^2 = 1.656$, 3 d.f., $P = 0.656$) nor were total ounces of beer or other malt beverages consumed ($X^2 = 4.51$, 3 d.f., $P = 0.2114$), RTDs ($\chi^2 = 5.321$, 3 d.f., $P = 0.1497$) or wine ($\chi^2 = 2.146$, 3 d.f., $P = 0.5428$). There were no significant age- or education-level-based differences in volume of alcohol consumed for any beverage type.

The Kruskal–Wallis test, adjusted for tied ranks, detected no significant difference in the total alcohol consumed (alcohol by volume) when classifying injuries as to whether they were intentional or unintentional ($\chi^2 = 0.87$, 1 df, $P = 0.35$), or whether they involved a motor vehicle crash ($\chi^2 = 3.33$, 1 df, $P = 0.07$) (data not shown). However, we found a lower level of alcohol reported consumed among those involved in motor vehicle crashes. This difference was not statistically significant at the 0.05 level but is directionally interesting given the small sample size. In our small sample, motor vehicle crashes were 1.9 times

TABLE 2. Motor vehicle crashes and caffeine and alcohol

	Motor vehicle crash injury	
	Yes	No
Consumed caffeine with alcohol		
Yes	2	8
No	10	85
Total	12	93
Prevalence	0.17	0.09
Prevalence ratio	1.9	
Fisher's exact test	0.32	

TABLE 3. Share of alcohol market by volume

	Volume consumed in ER sample (Oz)	Proportion of alcohol consumed in ER sample (%), (95% Confidence Interval)	National market share[e] (%)
Beer[a]	2,877.4	68.8 (67.3 to 71.1)	82.2
Spirits	945.0	22.6 (21.3 to 23.9)	6.1
RTD[b]	328.0	7.8 (7.1 to 8.7)	1.8
Wine	34.2	0.8 (0.6 to 1.1)	9.8
Cider	0	0 (0)	0.1
Total	4,184.6	100	100

[e]Based on millions of gallons in 2010 (Impact Databank Spirits, Table 2 & 3, 2011)
[a]Beer = Beer and malt liquor
[b]RTD = Ready to drink which includes flavored malt beverages (FMB) and alcoholic energy drinks (AED)

more prevalent among those who had mixed caffeine with alcohol compared to those who did not, although the sample was not large enough to attain statistical significance with Fisher's Exact Test ($p = 0.32$) (Table 2).

Consumption by Alcohol Type

In the ER sample, we saw a lower proportion of beer and other malt liquor consumed (68.8%; 95% CI = 67.3% to 71.1%) compared to the national market share of beer and other malt liquor (82.2%) as reported by Impact. The proportion of distilled spirits consumed in the ER sample (22.6%; 95% CI = 21.3% to 23.9%) was higher than the market share for distilled spirits in the United States (6.1%). The proportion of RTD beverages consumed by ER patients (7.8%; 95% CI = 7.1% to 8.7%) was higher than the proportion of RTDs consumed in the national market (1.8%). The proportion of wine consumed in the ER sample (0.8%; 95% CI = 0.6% to 1.1%) was lower than the national market share for wine (9.8%) (Table 3).

Among distilled spirits (DS) consumed by patients in the ER sample, vodka was consumed in the highest proportion (63.1%; 95% CI = 60.1% to 66.2%) and represented a higher proportion of consumption in the ER compared to vodka's share of the national DS market (32%). In the ER sample, the proportion of bourbon consumed (8.1%; 95% CI = 6.6% to 10.1%) was slightly lower than its share in the national DS market (11%); cordials/liquors, rum, tequila, and whiskey were all under-represented in the ER sample as well, when compared to their shares in the national DS market. Brandy/cognac (13%; 95% CI = 11.0% to 15.3% compared to 5.8% of national DS market) and gin (9.8%; 95% CI = 8.0% to 11.8% compared to 5.3% of national DS market) were over-represented in the ER sample (Table 4).

Consumption by Alcohol Brand

Budweiser beer was the alcohol brand consumed in the highest quantity within the ER sample (432 oz.) representing 15.0% (95% CI = 13.8% to 16.5%) of all beer consumed. This differs from the national market where Budweiser represents only 9.1% of the national beer market. Steel Reserve, a malt liquor, was the brand of alcohol consumed in the second highest quantity (374 oz.) representing 14.7% of the beer consumed in the ER sample (95% CI 13.5% to 16.1%) This differs significantly from the national market, where Steel Reserve represents only 0.8% of the beer market. The top five brands of alcohol consumed in the highest quantities were all beer, followed by Barton's Vodka (154 oz.), ranked sixth, representing 25.8% (95% CI 22.5% to 29.5%) of vodka consumed in the ER sample. The representation in the ER sample for this brand is markedly different from the share of the national vodka market for Barton's (2.8%). The list of the top 20 brands of alcohol by volume consumed in the ER sample includes 14 brands of beer, 5 brands of vodka and 1 brand of gin (Table 5).

TABLE 4. Share of distilled spirits market by volume

	Volume consumed in ER sample (Oz)	Proportion of alcohol consumed in ER sample (%), (95% confidence interval)	Share of national spirits market[f] (%)
Bourbon	76.7	8.1 (6.6 to 10.1)	11.0
Brandy/cognac	123	13.0 (11.0 to 15.3)	5.8
Cocktails & mixed drinks		0.0 (0)	3.5
Cordials / liquor	27.4	2.9 (1.9 to 4.2)	10.6
Gin	92.3	9.8 (8.0 to 11.8)	5.3
Rum	23.8	2.5 (1.7 to 3.8)	12.9
Tequila	1.7	0.2 (0.1 to 0.8)	6.1
Vodka	596.7	63.1 (60.1 to 66.2)	32.6
Whiskey	3.4	0.4 (0.1 to 0.9)	12.2
Total	945	100	100

[f]Data from Impact Databank 2011 for 2010 (Table 2–11)

TABLE 5. Top 20 brands of alcohol by volume consumed in the ER

Alcohol brand	Volume consumed in ER sample (Oz)	Alcohol type	Market share of alcohol type - ER sample[g] (%), (95% confidence interval)	National market share of alcohol type[h] (%)
Budweiser	432	Beer	15.0 (13.8 to 16.4)	9.1
Steel Reserve	374	Beer	14.7 (13.5 to 16.1)	0.8
Colt 45	368	Beer	13.5 (12.3 to 14.8)	0.4
Bud Ice	338	Beer	12.8 (11.6 to 14.1)	0.7
Bud Light	180	Beer	6.3 (5.4 to 7.2)	19.8
Barton's	154	Spirits–Vodka	25.8 (22.5 to 29.5)	2.8
Miller Lite	144	Beer	5.0 (4.3 to 5.9)	7.8
Guinness	137.4	Beer	4.8 (4.0 to 5.6)	0.5
Smirnoff	132.7	Spirits – Vodka	22.2 (19.1 to 25.8)	15.2
Corona Extra	120	Beer	4.2 (3.5 to 5.0)	3.4
King Cobra	112	Beer	3.9 (3.2 to 4.7)	0.5
McCall's	111.1	Spirits - Vodka	18.6 (15.7 to 21.9)	
National Bohemian	108	Beer	3.8 (3.1 to 4.5)	–
Samuel Adams beers	80	Beer	2.8 (2.2 to 3.5)	0.4
Yuengling Premium	72	Beer	2.5 (2.0 to 3.1)	0.9
Zelco	63.5	Spirits–Vodka	10.6 (8.5 to 13.5)	–
Seagram's extra dry gin	63.5	Spirits–Gin	68.8 (59.5 to 78.0)	23.74
Coors Light	60	Beer	2.1 (1.6 to 2.7)	8.6
Natural Light	60	Beer	2.1 (1.6 to 2.7)	4.6
Grey gGoose	49.7	Spirits–Vodka	8.3 (6.4 to 10.9)	5.4

[g]Based on ounces of alcohol consumed
[h]Data from Impact Databank 2011 for 2010 (Table 2–11)

DISCUSSION AND CONCLUSIONS

Our pilot study demonstrated that collecting alcohol type and brand data in a hospital emergency department is feasible, if labor-intensive. Physicians were welcoming of and cooperative with the research team, and the hand-held netbook methodology enabled the research team to conduct the survey in a very brief and unobtrusive manner. Securing patient agreement to participate in the study improved substantially when the research team wore white lab coats.

In our sample, women in the emergency department were more likely to report consuming higher quantities of ready-to-drink beverages, while men were more likely to report consuming higher quantities of beer and malt liquor. Compared to nationally representative estimates, these emergency department patients consumed higher quantities of vodka, gin, and brandy/cognac; they consumed lower quantities of bourbon, cordials/liquors, rum, tequila, and whiskey. This type of information could be useful to policy makers in assessing policies regarding differential taxation and physical availability of different types of alcohol, given that such policies are already commonplace in U.S. states and in some cities. To support such policy decisions, this type of information should be collected more broadly and more frequently.

Midway through our study, the U.S. Food and Drug Administration issued warnings to the leading manufacturers of alcoholic energy drinks which resulted in the removal of caffeine and other stimulants from the beverages (Jalonick, 2010). However, we considered the data collection effort sufficiently relevant that we continued the study, and ultimately were able to identify alcohol types and brands more likely to be consumed by our emergency department population than would be expected given their presence in the national marketplace.

Limitations of our study included the small sample size, limited to patients presenting at a single urban hospital emergency department; the temporal difference between the data on beverages consumed, collected in a single neighborhood in a single city in 2010–2011, and the market share data, reported nationally for 2010; and the use of self-report data. Surveys of alcohol consumption often find that the population under-reports its alcohol consumption, with surveys capturing as little as 30%–60% of the market as reported in sales data (Duffy & Waterto, 1984). Research team members noted a tendency to report small amounts of alcohol consumed relative to the respondents' earlier states of intoxication and injury severity. Given the vulnerable position of respondents, social desirability bias may also have played a consistent role in under-reporting the amount of alcohol consumed (Davis, Thake, & Vilhena, 2010). We did not record number of refusals in the study, but did find that refusals were infrequent after the research team donned white laboratory coats.

While our study cannot definitively identify problematic beverage types or brands beyond the neighborhood and city in which the data were collected, it did establish

that these data can be collected, and can provide insight into the alcohol consumption of an emergency department population, compared to the share of brands and types of alcohol in the broader marketplace.

Four malt liquors accounted for 46% of the beer consumed by our sample; these four beverages accounted for only 2.4% of beer consumption in the general population (Table 5). The prominence of malt liquor, which has higher alcohol content than regular beer, in the consumption profile of our emergency department sample population suggests some possible areas for future research. Given that the emergency department population we studied is majority African American, the high prevalence of malt liquor consumption may be a result of targeted marketing of malt liquor to this population, as studies of alcohol marketing have also found (Alaniz & Wilkes, 1998; McKee, Jones-Webb, Hannan, & Pham, 2011). Implications of this targeted marketing and its possible relationship to presentations in the emergency department should be further explored. Future research in larger samples of emergency department admissions for injury should also examine the relationship between the alcohol content of beer and severity of injury, as well as the prevalence of other drug use and alcohol and the relationship to injury in this segment of the emergency department population. Future research may also contemplate the use of a case-crossover or similar design to examine the association of drinking specific alcoholic brands with higher alcohol content and injury cases in the emergency room to facilitate causal inferences.

Policy implications of this kind of research could include requirements for clear labeling of alcohol content on malt beverage containers, including serving size labeling; limits on malt liquor availability and marketing; and graduated taxation of beer based on alcohol content to discourage consumption of higher-alcohol products.

Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

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GLOSSARY

Alcoholic energy drink: Alcoholic beverages with stimulant or "energy boosting" additives, such as caffeine, taurine, guaran or ginseng.

Episodic heavy drinking: Consumption of five or more drinks (each containing 16 ml of pure alcohol) in a day at least once in the past year but less than weekly.

Frequent heavy drinking: Consumption of five or more drinks in a day at least once or more per week.

Kruskal-Wallis test: A statistical test used for testing differences in a median value from two populations typically used when the distribution of the subject matter is not normally distributed thereby precluding the use of a parametric method for testing differences in mean values, such as one-way ANOVA.

Malt liquor: A North American term for a malt-based alcoholic beverage with alcohol content not lower than 5%.

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