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Accuracy of drinking behavior recall: Comparing late night BAC by breath analysis to estimated BAC from linked survey responses in a residential college environment

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ABSTRACT

Assessing risk due to alcohol consumption in collegiate populations is often achieved using measures of the frequency of use and the quantity of alcohol typically consumed (number of drinks). Since body weight, gender, and the time spent consuming alcohol all influence the degree of intoxication a better measure of risk rather than number of drinks is an individual's peak blood alcohol concentration (peak BAC). BAC can be measured in field tests directly using breath test instruments or estimated from survey data responses reporting the quantity of alcohol consumed, time of consumption, personal weight and height, and gender. 2,708 random anonymous double-blind late night breath tests have been conducted along with an anonymous but individual case linked survey of alcohol use just inside the entrance to residence halls in a collegiate environment between spring 2003 and fall 2012. Several methods for computing eBAC values have been evaluated by comparing their predictions to corresponding measured BAC values. An assessment of the accuracy of drinking behavior recall has also been conducted as a function of intoxication level. Finally, mathematical models have been developed to determine the eBAC during the pre-absorptive state and to assess the time after cessation of drinking required on average to reach full absorption and peak BAC for this college population. Results will inform survey researchers on the accuracy of personal alcohol use recall and on the relative accuracy of computational methods for eBAC determination.

<http://www.AlcoholEducationProject.org>

METHODS FOR ESTIMATING BLOOD ALCOHOL CONCENTRATION

AUTHOR	METHOD	REFERENCE
NHTSA	Average gender TBW	National Highway Traffic Safety Administration, "Computing a BAC Estimate" Office of Program Development and Evaluation, (1994). (Note: website reporting this method is no longer available)
WATSON UPDATE TO WIDMARK	TBW estimate from gender-age-height-weight empirical algorithm	Watson, Patricia E., Ian D. Watson, and Richard D. Batt. "Prediction of Blood Alcohol Concentrations in Human Subjects." <u>Journal of Studies on Alcohol</u> 42 (1981): 547-556. Brick, J. "Standardization of Alcohol Calculations in Research." <u>Alcoholism Clinical and Experimental Research</u> 30 (2006):1276-1286.
SEIDL	Distribution volume estimate from gender-weight-height-BMI matched to results from body fat analyzer. Better agreement than Watson above	Seidl S, Jensen U, Alt A. The calculation of blood ethanol concentrations in males and females. <u>Int J Legal Med</u> 2000; 114:71-7.

ETHANOL CLEARANCE RATE

AUTHOR	RESULT	REFERENCE
NHTSA	0.017 g/dL/hr for moderate drinkers, 0.020 g/dL/hr for heavy drinkers (>60 drinks/month)	National Highway Traffic Safety Administration, "Computing a BAC Estimate" Office of Program Development and Evaluation (1994)
WHITFIELD AND MARTIN	BAC increases with habitual use and with peak BAC. Clearance is not zero order.	Whitfield JB and Martin NG. "Alcohol Consumption and Alcohol Pharmacokinetics: Interactions Within the Normal Population" <u>Alcoholism: Clinical and Experimental Research</u> 18 (1994):238-243. Lee B-y, Yoon H-k, Baek I-h, Kwon K-I, "Population pharmacokinetics of multiple alcohol intake in humans" <u>Alcohol</u> 47 (2013):159-165
JONES	0.015 g/dL/hr for moderate drinkers, 0.019 for apprehended drinkers	Jones A W. Evidence-based survey of the elimination rates of ethanol from blood with applications in forensic casework. <u>Forensic Science International</u> 200 (2010): 1-20.

Estimation of blood alcohol concentrations in this study will use a metabolic rate of 0.015 g/dL/hr for moderate drinkers (mBAC<0.08 g/dL/hr or <60 drinks/month and 0.019 g/dL/hr for drinkers (>=60 drinks/month and mBAC>=0.08g/dL) reflective of a synthesis of the results from the references cited here.

This is an **anonymous survey**--- you will not be asked to submit your name. Please read each question carefully. There is no “right” or “wrong” answer—just give your best estimate. This survey is **voluntary**. If you do not wish to respond to a question you may leave it blank and continue on. Answering questions on this survey form constitutes your tacit agreement to participate in this study.

Information about you:

1. male
 female

Have you consumed alcohol in the last 15 minutes: yes no

2. Age _____

3. Class Rank: 1st 2nd 3rd 4th year
 graduate student

4. Current weight and height:
Weight _____ pounds Height _____ ft. _____ in

5. Campus Activities (check all that apply)

fraternity
 pledging now

varsity team
 team in season now

6. Indicate below how many classes you have tomorrow.

AM classes tomorrow 0 1 2 3
PM classes tomorrow 0 1 2 3

7. Do you feel that it would be safe for you to drive an automobile right now? yes no

Information about your typical alcohol consumption:

8. How often do you typically consume alcohol in a week?
_____ days per week (enter 0 if you don't drink)

9. Typical number of drinks consumed per occasion:
_____ drinks over _____ hours
(A drink is a 12 oz bottle of beer, a 4 oz glass of wine, a wine cooler, a shot of liquor, or a mixed drink with one shot.)

What has been your drinking experience tonight?

10. Number of drinks _____ none
(If none, thank you. You are done)

Start time of first drink tonight: _____ am/pm
Time finished most recent drink: _____ am/pm

11. What type of drinks have you consumed tonight?
(check all that apply)

- packaged beer
- draft beer
- packaged wine cooler, alcoholic lemonade, etc.
- wine
- mixed drink
- straight shot
- caffeinated drink (either with or without alcohol)
- 24oz packaged alcoholic beverage

12. Have you driven a car tonight after drinking?
 yes no

If yes, at what time did you start driving? _____

Information about your drinking environment:

13. How many people were with you while you were drinking? (check all that apply)

- I was alone
- myself and 1-2 others
- myself and 3-4 others
- myself and 5-9 others
- 10 or more people

14. Where were you drinking tonight? (check all that apply)

- my dorm room
- another's dorm room
- college owned house or apartment
- fraternity
- off campus residence
- bar
- other _____

How do you feel right now?

15. *circle one*

Sober A little buzzed Pretty Drunk Wasted

16. What do you think your blood alcohol concentration is right now?

BAC: _____ %

No idea what a BAC scale is

17. Which, if any, of the following has occurred tonight as a consequence of your drinking?
 (check yes or no for each consequence listed, a through j)

I did not drink tonight. (If checked Skip #17, 18) Thank you for taking the survey

	No, did not happen tonight	Yes, happened tonight
a. Physical injury to yourself	<input type="radio"/>	<input type="radio"/>
b. Physical injury to others	<input type="radio"/>	<input type="radio"/>
c. Fighting	<input type="radio"/>	<input type="radio"/>
d. Damage to property	<input type="radio"/>	<input type="radio"/>
e. Damaged friendships or relationships	<input type="radio"/>	<input type="radio"/>
f. memory loss	<input type="radio"/>	<input type="radio"/>
g. Impaired driving	<input type="radio"/>	<input type="radio"/>
h. Rode with an impaired driver	<input type="radio"/>	<input type="radio"/>
i. Attempted intimate physical/sexual contact NOT desired by other person	<input type="radio"/>	<input type="radio"/>
j. Were sexually active when otherwise might NOT have chosen to be	<input type="radio"/>	<input type="radio"/>
k. throwing up	<input type="radio"/>	<input type="radio"/>
l. Trouble with campus safety or police	<input type="radio"/>	<input type="radio"/>

18. Which of the following strategies did you employ to reduce your risk when consuming alcohol tonight? (check yes or no for each strategy listed, a through g)

	No, I did not use this strategy tonight	Yes, I used this strategy tonight
a. Limit consumption to 1 drink/hour	<input type="radio"/>	<input type="radio"/>
b. Eat before and/or during consuming alcohol	<input type="radio"/>	<input type="radio"/>
c. Limit the amount of money that I bring to spend on alcohol	<input type="radio"/>	<input type="radio"/>
d. Alternate alcoholic and non-alcoholic drinks	<input type="radio"/>	<input type="radio"/>
e. Have a designated driver	<input type="radio"/>	<input type="radio"/>
f. Limit consumption so that my BAC is 0.05 or below	<input type="radio"/>	<input type="radio"/>
g. Have a friend with you	<input type="radio"/>	<input type="radio"/>

Thank you for your time.