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

<table>
<thead>
<tr>
<th>AUTHOR</th>
<th>METHOD</th>
<th>REFERENCE</th>
</tr>
</thead>
</table>

## ETHANOL CLEARANCE RATE

<table>
<thead>
<tr>
<th>AUTHOR</th>
<th>RESULT</th>
<th>REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHTSA</td>
<td>0.017 g/dL/hr for moderate drinkers, 0.020 g/dL/hr for heavy drinkers (&gt;60 drinks/month)</td>
<td>National Highway Traffic Safety Administration, “Computing a BAC Estimate” Office of Program Development and Evaluation (1994)</td>
</tr>
<tr>
<td>MARTIN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>JONES</td>
<td>0.015 g/dL/hr for moderate drinkers, 0.019 for apprehended drinkers</td>
<td>Jones A W. Evidence-based survey of the elimination rates of ethanol from blood with applications in forensic casework. Forensic Science International 200 (2010): 1-20.</td>
</tr>
</tbody>
</table>

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 (&gt;=60 drinks/month and mBAC&gt;=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.)

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 __________

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
    □ caffienated 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? ________

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

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

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)

<table>
<thead>
<tr>
<th></th>
<th>No, I did not use this strategy tonight</th>
<th>Yes, I used this strategy tonight</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Limit consumption to 1 drink/hour</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>b. Eat before and/or during consuming alcohol</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>c. Limit the amount of money that I bring to spend on alcohol</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>d. Alternate alcoholic and non-alcoholic drinks</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>e. Have a designated driver</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>f. Limit consumption so that my BAC is 0.05 or below</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>g. Have a friend with you</td>
<td>□</td>
<td>□</td>
</tr>
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Thank you for your time.
Accuray of drinking behavior recall: Comparing late night BAC by breath analysis to estimated BAC from linked survey responses in a residential college environment

David Craig and H. Wesley Perkins, Hobart and William Smith Colleges, Geneva, NY

1. 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). mBAC 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 spring 2013. 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 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.

2. Protocol for Conducting a BAC Survey
Data collection times were selected when the perceived greatest amount of drinking was taking place – 11pm – 3am. Measurement stations were established just inside a randomly selected residence hall each night of the week. Subjects were randomly selected as they passed through the hall entrance. Subjects were provided with an explanation of the goals of the project, the anonymity of the data collected, and asked for their voluntary participation. Subjects agreeing to participate submitted a breath sample for analysis on an instrument that displayed a sample number and stored the alcohol result internally. Subjects then completed a short two page survey. Subjects were provided with a card with their sample number and web address where they could anonymously see their BAC result the next day.

3. Data Collection Station

4. Sample Characteristics
- 2,708 Participants through Spring 2013
- 54% males, 46% females
- Age: 18-21
- Class rank: 49% 1st yr, 26% 2nd yr, 14% 3rd yr, and 9% 4th yr
- 15% over 21, 85% under 21
- Percentage of students through Spring 2013

5. BAC Distributions

6. Factors influencing mBAC measurement
- Breath measurement just minutes after drinking adds alcohol to exhaled breath from drink residue still in saliva. BAC measures high.
- Breath measurement prior to full absorption of alcohol into the blood and distribution into the water tissues results in a lower mBAC relative to the eBAC

7. Possible factors influencing eBAC
- Intentional dishonesty in reporting drinking and body measures
- Recall error in number of drinks, drinking start time, drinking end time.
- Other subjective inaccuracies

8. Correlation of eBAC with mBAC
Subsample (N=426) of drinkers only, breath test took place 60 minutes or more after last drink consumed, all survey results complete with weight, height, age, number of drinks, and start and end time for drinking.

9. Linear regression analysis of three models for eBAC using drinkers only with mBAC ≤ 0.10 g/dL

10. Analysis of pre-absorptive suppression of mBAC potential

11. Comparing eBAC with mBAC for assessing student population drinking norms based on overall impairment levels

12. Social norms posters using prevalence of low BAC impairment levels
The MAJORITY are SOBER
On School Halls
On Weekend Halls
AND ALSO