Low Blood Alcohol Content:  
Overview of Performance, Safety, and Policy Implications

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Keywords
Alcohol, performance, effects, prevention

Abstract
A workshop organized by the Transportation Research Board Committee on Alcohol, Drugs, and Transportation provided a forum for discussing and integrating current knowledge on various aspects of low blood alcohol content. The paper describes some of the issues that emerged at the workshop.

Introduction
In recent years, increasing attention has been paid to the effects of low levels of alcohol on performance and safety. Lower blood alcohol limits have been set for driving in many countries, for drivers under 21 in the United States, and for operators of commercial vehicles and all pilots. What is the scientific basis for these policy changes? Are further policy changes suggested by research? What public safety messages are supported? A workshop organized by the Transportation Research Board Committee on Alcohol, Drugs, and Transportation provided an opportunity to review and synthesize the available research on the performance and safety effects of low levels of blood alcohol content (BAC) and to draw conclusions based on the synthesis.

Methods
The workshop covered several major topics, including:

1. Experimental evidence of effects of low BACs on performance, including both laboratory testing of performance and testing on driving simulators
2. The various factors that enhance or mitigate the effects of low BACs
3. The epidemiology of low BACs in traffic, including the number and characteristics of drivers with low BAC in the traffic flow and the incidence of crashes involving drivers with low BACs.
4. The risk of harm associated with low BAC in various situations
5. The effects of policies lowering BAC limits
6. The policy implications of the research findings

Papers were written and presented by experts in each of the areas and responses to the papers were prepared and presented by discussants. Each of the topics was then discussed by the group as a whole and conclusions were formed based on the papers and discussions.
Results
Several overarching conclusions came out of the presentations and discussions. These conclusions may be useful to policymakers and researchers in the transportation safety field.

Evidence of impairment

Measurable impairment of performance begins at the lowest blood alcohol levels - .02 percent and even .01 percent in some tasks. Not all performance measures are affected equally. While there is some interpersonal variation, it has been found that there are no consistent differential effects of age, gender, or drinking history on the effects of alcohol on performance.

Epidemiological studies, including case control studies of traffic crashes, are consistent with the experimental evidence on the effects of low levels of alcohol. The convergence of evidence from these two lines of research provides the scientific justification for low legal limits for alcohol in drivers and other transportation operators.

Performance versus behavior

While performance on a variety of cognitive and psychomotor tasks is measurably impaired at very low levels of BAC, overt, observable behaviors are not dependably changed by alcohol. Thus, an individual’s driving performance may be impaired while behavior is not obviously affected by alcohol. This situation makes individual judgments about fitness to drive unreliable. Thus, a person who is drinking might not feel impaired or appear impaired to companions, but actually is impaired on important driving-related tasks. Similarly, enforcement based on observation of impaired behavior is difficult. In fact, law enforcement officers have been shown to be very unreliable in their ability to determine whether or not a driver is impaired even when they are given the opportunity to observe the driver closely.

In the United States, the legal structure requires that police have “probable cause” for stopping and testing a motorist. That is, there must be some observable behavior or other sign to indicate that alcohol might be present. This amounts to a behavior-based enforcement system and thus makes enforcement more difficult than in countries that permit chemical testing more broadly, for example in random breath testing. This problem could be reduced through the widespread use of passive breath sensors in sobriety checkpoints and in normal traffic patrols. These sensors can detect the presence of alcohol without violating legal restrictions, thus identifying drivers who should be examined further.

The effects of lowered legal limits

Research indicates that lowering the legal alcohol limit for drivers has resulted in safety improvements. The types and rigor of methods used to evaluate the effects of changes vary, as does the strength of the results. In most but not all cases, improvements have occurred in countries when the limit has been lowered to .05 and below and in the United States when the limit has been lowered to .08 in some states and to .02 or lower for drivers under 21. The size of the effects varies and the duration of the improvement is not always known. Improvements are
also reported in commercial transport when lowered limits were established, although formal evaluations have not been carried out.

The reductions in crashes have occurred for drivers at all blood alcohol levels. Thus, in states that have reduced the limit from .10 to .08, crash rates have been reduced for drivers with high BACs as well as among drivers with BACs between .10 and .08. This reduction is likely due to a variety of factors, including increased media attention to impaired driving, a general sense that laws are stricter and enforcement more likely, and changes in norms surrounding changes in the law. Some safety improvements have occurred even in situations where enforcement of the lowered limits has been weak.

**Misleading messages concerning legal limits**

Current laws concerning blood alcohol limits may convey the message that drivers can operate safely until they reach the legal limit. Safety improvements might result from better public understanding of the nature of impairment. The public should understand that impairment begins with the first drink and that driving impairment is present even when overt behavioral signs of intoxication are absent.

**Gaps in knowledge**

While existing research can provide important guidance regarding laws, policies and practices related to low blood alcohol levels, significant knowledge gaps remain. Additional research would refine our current level of understanding. Remaining questions include a more detailed understanding of what particular performance impairments are most important in causing traffic crashes, what factors might help to mitigate the effects of alcohol, more details about the presence of alcohol in divers on the road at all hours of the day and days of the week, the role of alcohol in non-fatal crashes, etc.

**Policy implications**

While research indicates the impairing effects and increased crash risks of even low levels of alcohol, determining the best policy response is a social and political task. Each country tries to achieve the appropriate balance between reducing risks and permitting relative freedom of behavior. This balance clearly varies from country to country and evolves over time. In recent years in most countries the trend has been a steady reduction in BAC limits in response to the emerging science and the public intolerance of impaired driving.

Obviously, when dealing with relatively low BAC levels, it can be argued that other factors also increase driving risks, including fatigue and driver distraction. In addition, risks related to alcohol impairment occur in other areas besides driving, for example, operating boats and other recreational vehicles (such as snowmobiles).

It is an open question in the United States whether the benefits of further lowering legal limits outweigh the costs, including increased difficulty of enforcement. Improvements in safety might occur with better enforcement of existing laws and better public understanding of the risks of
driving at BACs below the current legal limit. Clearly, however, lowering the limit below .08 in other countries has resulted in safety improvements. Additional research and analysis can provide more detailed understanding and inform policy decisions.

**Discussion**

The TRB workshop helped to bring together and synthesize a wide range of research findings regarding the nature of impairment at low BACs, the role of low BAC in traffic crashes, and potential policy responses to these findings. The full report on the workshop will be released by TRB and will be available through ICADTS. Other papers presented at T2002 present more detailed descriptions and updates of the research discussed at the workshop.