

BLOOD ALCOHOL CONCENTRATION LIMITS WORLDWIDE

INTRODUCTION

This issue of *ICAP Reports* is intended to serve as an international guide to the levels of blood alcohol concentration, or BAC¹, permitted for motor vehicle operators. It will also explore the rationale and recent history behind the setting of these limits, and the systems of enforcement and sanctioning which support them.

BACKGROUND

Beverage alcohol is widely enjoyed the world over in countless different settings and by a great many people. It is well recognized that irresponsible drinking patterns, coupled with certain behaviors, such as driving, may bring about a range of harmful outcomes (Grant & Litvak, 1998). Accordingly, many countries agree on the need to establish regulations that prohibit impaired driving, particularly as it applies to the operation of automobiles on public roads. The setting of maximum allowable BAC levels is a tool for enforcement and for prevention.

The offense of driving with a BAC above the legal limit is variously known as “driving under the influence” (DUI), “driving while intoxicated” (DWI), “drink-driving,” or “drunken driving,” among other similar names. It is important to note, however, that this does not mean they may be used interchangeably. In fact, certain jurisdictions apply these terms, or others, quite selectively, based on a specific drink-driving behavior or offense.

In Japan, for example, a charge of *sakeyoi unten* (literally, “driving while intoxicated”) may apply based on nothing more than a police officer’s observations, while *syukiobi unten* (“driving under the influence”) applies to a person whose BAC has crossed the 0.5 mg/ml threshold level (Deshapriya & Iwase, 1996). In Sweden, a charge of drunken driving is applied to a driver who has been found to have a blood alcohol level that has achieved the lower, 0.2 mg/ml threshold, while “aggravated” drunken driving is reserved for those whose BAC has surpassed the upper limit of 1.0 mg/ml (Borschos, 2000). In addition, some jurisdictions have established separate charges to describe such things as a grossly elevated BAC or a drink-driving accident which causes personal injury or death, and may reserve separate and harsher punishments for these offenses.

The issue of drinking and driving first began to attract attention as populations and automobile ownership increased in the late 19th and early 20th centuries (Moskowitz et al., 2000; Jones, 1990). The first laws drafted against drink-driving reflected the early state of transport using carriages, horses and cattle, and steam engines. They were later amended to include motor vehicles as these became more common (Institute for Alcohol Studies, 2002).

¹ BAC represents the amount of ethanol in a given amount of blood, and is noted as “weight by volume.” The most commonly used measurements are grams of ethanol per milliliter of blood (g/ml), used in the United States, and milligrams of ethanol per milliliter of blood (mg/ml), used in much of Europe. For example, .05 g/ml=50 mg/ml. In this paper, the European “mg/ml” designation is used.

As government and public concern over the issue grew, and subjective evaluation of physical symptoms of intoxication proved inadequate for judicial use, the measurement of ethanol in bodily fluids was first investigated as a more reliable measure of impairment (Jones, 1990). Alcohol is absorbed into the blood stream at different rates by different individuals, depending on total body water content (Thomasson, 2000), age, and gender differences (Kalant, 2000). Genetic traits (ICAP, 2001) and consumption of food prior to or while drinking alcohol (Gentry, 2000) may also affect its absorption and metabolism.

The most common method of determining BAC is by measuring the alcohol in an exhaled sample of breath. This figure is then converted into a representation of BAC. In response to claims that breath alcohol levels do not reliably mirror blood alcohol levels, certain countries, including Austria, France, Norway, Singapore, Sweden, The Netherlands, and the United Kingdom, have specifically legislated a “breath alcohol content,” or BrAC (Jones, 1990), in addition to a BAC. The chief advantage to the breath testing method is that it is easily administered and allows for an immediate reading of BAC.

Other tests involve measuring bodily fluids, and are generally carried out at clinical facilities. The technical accuracy of urine samples suffers from the same need for a conversion factor as breath tests. In addition, from an enforcement point of view, both urine and blood samples may be less practical than an immediate breath test, as an individual’s BAC may change during the time needed to reach an appropriate testing facility. A recently developed method of determining BAC is performed using skin perspiration, measuring the ethanol present, and converting it into a measure of BAC. The reliability of this method, however, is also in some dispute (Swift, 2000).

BAC LEVELS WORLDWIDE

While many countries have legislated maximum permissible BAC levels, the threshold at which each country draws its line varies considerably. Table 1 represents the current BAC legislation in selected countries, gathered and compiled from various sources².

As reflected in Table 1, the threshold for the maximum allowable BAC for drivers ranges from a level of 1.0 mg/ml to a level of zero tolerance (0.0 mg/ml). The United States has the highest permissible BAC level, with some jurisdictions maintaining 1.0 mg/ml as the BAC threshold for impaired driving. Nine countries have set their BAC level at 0.8 mg/ml, while 27 countries use 0.5 mg/ml as their legislated BAC. Only Lithuania’s BAC is designated to be 0.4 mg/ml, while three countries (Georgia, Moldova, Turkmenistan) have designated it at 0.3 mg/ml. Norway and Sweden stand together at 0.2 mg/ml, and Albania is alone at 0.1mg/ml. Eight countries do not allow any traces of alcohol in a driver’s blood, while Russia designates its standard only with the term “drunkenness.” It is important to note that Table 1 does not include all countries, and that a number do not have drink-driving legislation at all or simply have not set a maximum BAC level.

In addition to the standard BAC limit that applies to adult drivers, some countries have a more restrictive limit for younger or less experienced drivers. Australia, Austria, Canada, Croatia, Italy, Macedonia, New Zealand, Slovenia, Spain, and the United States are among these, with either fixed age definitions or probationary periods following the initial granting of a license (at any age) at which a lower BAC level applies (Stewart, 2000). While this lower limit tends toward zero tolerance for such drivers, in practice it is often set at 0.2 mg/ml (Deshapriya & Iwase, 1996) in order to reduce the possibility that other variables could confound the BAC reading.

² Information courtesy of the Centre for Information on Beverage Alcohol, London, UK; Rehn, Room, & Edwards, 2001; Riley & Marshall, 1999

| TABLE 1: STANDARD BAC LIMITS | | | |
|------------------------------|-------------------------|-----------------|-------------------------|
| Country | Standard BAC (in mg/ml) | Country | Standard BAC (in mg/ml) |
| Albania | 0.1 | Lithuania | 0.4 |
| Argentina | 0.5 | Luxembourg | 0.8 |
| Armenia | 0 | Malta | 0.8 |
| Australia | 0.5 | Moldova | 0.3 |
| Austria | 0.5 | The Netherlands | 0.5 |
| Azerbaijan | 0 | New Zealand | 0.8 |
| Belarus | 0.5 | Norway | 0.2 |
| Belgium | 0.5 | Peru | 0.5 |
| Bosnia and Herzegovina | 0.5 | Poland | 0.5 |
| Bulgaria | 0.5 | Portugal | 0.5 |
| Canada | 0.8 | Romania | 0 |
| Croatia (Republic of) | 0.5 | Russia | "drunkenness" |
| Czech Republic | 0 | Singapore | 0.8 |
| Denmark | 0.5 | Slovak Republic | 0 |
| Estonia | 0 | Slovenia | 0.5 |
| Finland | 0.5 | South Africa | 0.5 |
| France | 0.5 | South Korea | 0.5 |
| Georgia | 0.3 | Spain | 0.5 |
| Germany | 0.5 | Sweden | 0.2 |
| Greece | 0.5 | Switzerland | 0.8 |
| Hungary | 0 | Thailand | 0.5 |
| Iceland | 0.5 | Turkey | 0.5 |
| Ireland | 0.8 | Turkmenistan | 0.3 |
| Israel | 0.5 | United Kingdom | 0.8 |
| Italy | 0.5 | United States* | 0.8/1.0 |
| Kyrgyzstan | 0 | Zimbabwe | 0.8 |
| Latvia | 0.5 | | |

*Permissible BAC is currently set individually by each state; All must conform to a .8 standard before October 1, 2003 or risk losing certain Federal funding

It is not only automobile operators who are required to conform to certain BAC restrictions. The operators of other forms of recreational transport, such as bicycles, snowmobiles, and personal aircraft may be held to similar standards. In many jurisdictions where a permissible drink-drive level is in force, it applies regardless of the type of motorized vehicle (Rehn et al., 2001). Sometimes prohibitions are more vague, such as in the United Kingdom, where the language simply bars individuals from operating a pedaled bicycle while under the influence of alcohol (Department of Transport, Environment, and the Regions, 2002).

BAC restrictions are not limited to personal or recreational vehicles. Some countries, including Australia, Austria, Portugal, Spain, and the United States have an equal or more restrictive BAC limit for drivers of certain types of commercial vehicles. These may include trucks above certain gross weight limits, those carrying dangerous goods, or passenger vehicles that carry more than a certain number of people, such as buses, taxicabs, and ambulances. In the United States, a violation of a 0.4 mg/ml limit by a commercial driver is cause enough to remove him/her from service for 24 hours (Stewart, 2000). Limits also exist for the commercial operators of non-automotive vehicles. For example, in the United Kingdom the same 0.8 mg/ml BAC level applies to railroad and subway workers, as well as to the crews of commercial boats (Department of Transport, Environment, and the Regions, 2002).

BAC POLICY

Setting BAC Levels

The countries in Table 1 were chosen to highlight the wide range of BACs which have been deemed acceptable for drivers by their respective governments. The setting of these limits relies on clinical research showing impairment of driving-related abilities at certain BAC levels (Moskowitz & Fiorentino, 2000; Moskowitz et al., 2000). Driving simulators have also been used to determine appropriate BAC limits, but may not adequately represent the experience of actual driving behavior. Regardless, the setting of a BAC limit is based on a number of factors (Kenkel, 1998; Rehn et al., 2001; Mann et al., 2001), including weighing historical evidence and perceived risk against the public convenience and cultural acceptability of such restrictions on individuals' behavior.

Studies from various countries have found that among drinking drivers, most have BACs below the legal limit in their jurisdiction (Odero & Zwi, 1997; Penttila et al., 2000; Gledec, 2000). As a result, lowering the limit in those situations could be perceived as an unwelcome policy change, infringing on the established drinking behavior of a great many people. In addition, the resulting increase in the number of possible drink-drive offenders would necessitate the expenditure of significantly more law enforcement resources to deal with their processing.

Since the birth of the concept of a maximum permissible BAC, there has been a general trend toward making the levels more stringent. However, research examining the specific effect of lowering the BAC in various jurisdictions worldwide is inconclusive. Evidence from Austria, Denmark, Germany, Sweden, the United States, and elsewhere has shown reductions in the number of reported drink-drive trips and injurious or fatal accidents after BAC levels were lowered (Bartl & Esberger, 2000; Borschos, 2000; Vollrath & Krueger, 2000). Other research has been unable to find resultant decreases (Foss et al., 2001), and in some cases, an increase in the proportion of fatal accidents involving alcohol (Bernhoft, 2000) has been reported. It has been suggested that other factors such as increased patrolling and enforcement of BAC laws and heightened public awareness of drink-driving issues are largely responsible for decreases in drink-driving infractions following the lowering of the legal BAC (Mann et al., 2001; Apsler et al., 1999; Vollrath & Kreuger, 2001; Bartl & Esberger, 2000)

It is also possible that so-called "hard core" drink-drivers and recidivist drink-drivers may be impervious to the setting of BAC limits. Studies conducted in the United States and Canada (Simpson et al., 1996; Mayhew et al., 1998) found that 65% of all drinking driver fatalities and 72% of all tested fatally injured drinking pedestrians had BACs over 1.5 mg/ml. This is almost twice the established level in much of Canada and the USA, suggesting that these individuals might pay little attention to a further tightening of the level. In addition, over 20% of all convicted drink-driving offenders have prior drink-driving offenses. Such disregard for the established limit calls into doubt the efficiency of minor changes to the permitted BAC level, at least for these groups of drivers.

Prevention and Enforcement

The legal threshold for intoxication for operating a motor vehicle is not the only aspect of BAC that lacks international consensus. Prevention, enforcement, punishment, and the treatment and processing of offenders varies widely as well.

An established BAC serves both as a legal threshold above which offending drivers may be punished, and as a reminder to individuals of the illegality of drink-driving. However, though drink-driving is known to be

a potentially dangerous behavior, there is evidence that some people are neither aware of the legal limit which applies to them, nor of how much alcohol they may consume before reaching the limit (The Century Council, 1998). Public education campaigns to raise general awareness of local BAC limits have been widely called for as an effective means of reducing drink-driving and associated harm (Scheinberg & Stouffer, 1999; Bloomberg, 1992; Worden et al., 1989). Such campaigns have been implemented in a range of countries worldwide by government agencies, industry bodies, and advocacy groups, such as Mothers Against Drunk Driving (MADD).

In addition to raising awareness, consistent enforcement of drink-driving laws and BAC standards has been shown to be an effective public deterrent (Traffic Injury Research Foundation, 1998). Such enforcement has taken the form of random breath testing, sobriety checkpoints, broad police patrols, and officer training to allow increased identification of drink-drivers (Stewart & Sweedler, 1997; British Medical Association, 1996; Karlovsek & Zlender, 1996). Australia has been an often-cited example of the effectiveness of the introduction and vigorous enforcement of random breath testing in reducing drink-driving and harmful outcomes (Homel, 1993). Certain countries or jurisdictions, however, do not permit random breath testing (Rehn et al., 2001).

Venues other than public roads may also benefit from increased enforcement vigilance. Various hospital emergency room studies have shown that only a small percentage of drivers admitted following alcohol-related automobile accidents are arrested after receiving medical attention, even though there is clear laboratory evidence that their BAC exceeds the legal limit (Cydulka et al., 1998; Goldman et al., 1998). Inconsistency among police officers and court officials in the prosecution of drink-drivers (Jonah et al., 1999; McCartt et al., 1998) may also lead to an underestimation of the severity of the issue.

Punishments meted out to drink-drivers vary widely in style and severity. Monetary fines are common, and often rise with multiple convictions or as BAC levels increase. In some places, including Finland and Sweden, the amount of a fine may be based in part on the offender's income (Stewart, 2000). In others, an automatic license suspension may be called for on the first offense, immediately upon failing or refusing to take a BAC test. This type of suspension is frequently an immediate administrative action rather than a judicial one, and is intended to be a rapid and effective response to public danger (Apsler et al., 1999). Imprisonment and license suspension are widely used, as well, especially for cases involving repeat-offenders or drivers with a particularly high BAC. In cases involving accidents with injuries or fatalities, these sanctions may include a permanent revocation of license or many years' incarceration (Rehn et al., 2001).

In other cases, more instructive punishments have been applied to convicted drink-drivers, in the hopes that the experience will give them perspective on the harm that their actions could have caused. In the United States, these have included morgue or hospital visits to view accident victims and mandatory discussions with victims of drink-driving accidents or their relatives. Such measures have shown mixed results in terms of changing attitudes and future behavior (Kingsnorth, 1991; Fors & Rojek, 1999). Alcohol education and compulsory treatment have been controversial when used as a rehabilitative punishment for drink-driving. The argument has been made that Alcoholics Anonymous and other such groups may be effective in changing the behavior of certain people, but may be inappropriate for others. In addition, many people convicted of drink-driving are not otherwise appropriate candidates for such programs (O'Callaghan, 1990; Fillmore & Kelso, 1987). Another sanction is the use of alcohol interlock devices which require that a breath test be taken before starting the engine. This tool is intended to prevent drink-driving as it only monitors and prevents the behavior for which it was assigned (Marques, 1999).

CONCLUSION

In summary, while the establishment of a maximum allowable BAC level for automobile drivers has been a widely adopted method for controlling drink-driving in many countries, there is a lack of agreement on where such a level should be set. In addition, the use of drink-driving limits is perhaps most effective as one aspect of a more comprehensive solution (Mann et al., 2001) which includes increased public education on the risks associated with drink-driving, enforcement of related laws, and implementation of steps to prevent impaired driving. Such measures also include training staff at licensed premises to recognize intoxication among patrons, and the availability of alternatives to driving, such as free taxi service. Focused measures aimed at those drivers whose drinking patterns may result in reckless behavior are an effective measure for harm reduction.

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