

MODULE 16 BLOOD ALCOHOL CONCENTRATION LIMITS

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Summary:

- Alcohol consumption impairs reaction time in a dose-dependent manner: The more alcohol a person drinks, the slower his or her reaction time becomes.
- Drivers’ inability to make quick decisions under the influence of alcohol increases the likelihood of involvement in road traffic crashes.
- The setting of blood alcohol concentration (BAC) limits for drivers is an effort to prevent impairment and resulting accidents and injuries.
- Most countries around the world have legislation around blood alcohol content in drivers, ranging from 0.0 mg/ml to 0.8 mg/ml. Punitive measures for those above the set limit vary among countries.
- In some countries, lower than general BAC limits are set for young, inexperienced drivers and operators of commercial vehicles.
- BAC limits alone are insufficient to prevent problems; enforcement through breath and blood tests is needed to ensure compliance.

Alcohol consumption is known to impair reaction time and affect an individual’s ability to execute a range of motor tasks (e.g., Grant, Millar, & Kenny, 2000; Parks et al., 2002; Roldán, Frauca, & Duenas, 2003). Driving

is an activity that requires precision, relying heavily on motor skills, reflexes, and the ability to make quick decisions. Reaction time of an inebriated driver may be reduced by 10 to 30% as compared to a sober individual. In addition, vision is blurred, and the judgment of distance, speed, and hazards is impaired (Davis, Quimby, Odero, Gururaj, & Hijar, 2003).

A person’s risk of being involved in a traffic crash and likely injury severity increase exponentially with the amount of alcohol consumed (Blomberg et al., 2009; Borkenstein et al., 1964; Global Road Safety Partnership [GRSP], 2007; Moskowitz, Blomberg, Burns, Fiorentino, & Peck, 2002; Moskowitz & Fiorentino, 2000; Mounce & Pendleton, 1992). There is evidence that even drivers with a blood alcohol concentration (BAC) level between 0.2 and 0.4 mg/ml are 1.4 times more likely to be involved in crashes than those who have not been drinking. Involvement in fatal crashes is much more likely for drivers with BAC levels over 0.5 mg/ml than in drivers who have not consumed alcohol (Blomberg et al., 2009; GRSP, 2007; Zador, 1991; Zador, Krawchuk, & Voas, 2000).

Measures have been put in place around the world to attempt to reduce the incidence of road traffic crashes and to prevent those who

are intoxicated from driving (see MODULE 15: Drinking and Driving). One of these measures, specifically targeted at drinking and driving and implemented in most countries around the world, relies on the establishment of legally defined BAC limits (International Center for Alcohol Policies, 2002; Österberg & Karlsson,

2003; World Health Organization [WHO], 2004, 2009). A person's BAC level is represented by the amount of ethanol in a given amount of blood. It is measured as either grams of ethanol per deciliter of blood (g/dl), used in the United States, or milligrams of ethanol per milliliters of blood, used in much of Europe.

Defining “blood alcohol concentration”

There are various means of determining an individual’s BAC level, the most common and inexpensive of which is by measuring the alcohol in an exhaled sample of breath, BrAC (Jones, 1990). Law enforcement personnel can administer this test quickly on the scene when alcohol intoxication is suspected. Other tests measure alcohol content in bodily fluids and are generally carried out in clinics or laboratories. While blood samples offer a more reliable measure of alcohol content, both urine and blood samples are less practical from an enforcement point of view as they do not provide immediate results (Currier, Trenton, & Walsh, 2006). In addition, in the time needed to reach a clinic or other testing sites, an individual’s BAC may drop, resulting in a lower reading.

As with alcohol’s effect on the body in general, BAC levels are influenced by a number of factors that include drinking patterns (Gentry, 2000a, 2000b; Kalant, 2000; Li et al., 2000; Stimson, Grant, Choquet, & Garrison, 2007; Stockley & Saunders, 2010; Thomasson, 2000). How much alcohol an individual has consumed and over what period

of time determine BAC levels as functions of absorption and metabolism rates. A drinker’s weight, gender, health, and food intake affect the levels of blood alcohol that are reached (see ANNEX 1: The Basics about Alcohol). In general, BAC increase is less rapid with greater body weight and with food intake, and is less rapid in men than in women.

BAC limits in different countries

Most countries around the world have taken steps to minimize the potential harm that can result from impaired driving by setting maximum legally permissible BAC levels for drivers (e.g., International Center for Alcohol Policies, 2002; Österberg & Karlsson, 2003; Stewart, 2000; WHO, 2004, 2009). These levels are generally defined by governments, based on best available evidence about risk and the effects of alcohol on the ability to perform certain tasks. Other factors also play a role, including public convenience, the cultural acceptability of drinking, and the palatability of legislation measures. How information about BAC levels is communicated in different countries and how limits are enforced also differs worldwide (WHO, 2009).

Established maximum legal BAC thresholds range from 0.0 mg/ml—the level of “zero tolerance”—to 0.8 mg/ml. Only a handful of countries do not set a legal BAC limit. Out of all nations reporting to a WHO survey published in 2004, 28% set their BAC limit at a “lower” level (0.0–0.3 mg/ml), 39% set limits at a “middle” level (0.4–0.6 mg/ml), and 26% have adopted a “higher” limit (0.6 mg/ml and above). Only 7% of countries did not legislate a maximum permissible BAC level (WHO, 2004). Table 16.1 offers examples of BAC levels in effect in a number of countries around the world (for a regularly updated table listing BAC limits worldwide, see <http://www.icap.org/Table/BACLimitsWorldwide>).

Special considerations

Research shows that the likelihood of road traffic crashes and injury is higher in young people than in older individuals at the same BAC levels (GRSP, 2007; Hingson & Kenkel, 2004; Zador, 1991). As a result, some countries impose a special BAC limit for young or less experienced drivers (Blomberg,

1992): In a 2009 World Health Organization report, 19 out of 139 participating countries set lower BAC limits for young drivers than for the general population (WHO, 2009).

BAC limits are not confined exclusively to drivers of automobiles. In some countries, operators of various forms of recreational vehicles (e.g., bicycles, snowmobiles, and personal aircraft) are also required to conform to BAC regulations (International Center for Alcohol Policies, 2002). In many instances, special legislation addresses BAC limits for operators of commercial vehicles, airline pilots, drivers of buses, trucks, and taxis, captains of ships, and others who are responsible for the safety of the passengers they convey. BAC limits for these individuals may be set at the national level, but standards are also determined at the international level by specialized authorities, such as those overseeing aviation or trucking. In addition, individual airlines or transportation companies may have their own limits for BAC levels of their pilots and drivers, often at the “zero tolerance” level.

Table 16.1 Standard BAC Limits

Country	Standard BAC (mg/ml)	Country	Standard BAC (mg/ml)
Albania	0.1	Lithuania	0.4
Argentina	0.5	Luxembourg	0.8
Armenia	0.0	Malta	0.8
Australia	0.5	Moldova	0.3
Austria	0.5	The Netherlands	0.5
Azerbaijan	0.0	New Zealand	0.8
Belarus	0.5	Norway	0.2
Belgium	0.5	Peru	0.5
Bosnia and Herzegovina	0.3 (0.0 for bus and truck drivers)	Poland	0.2
Bulgaria	0.5	Portugal	0.5
Canada	0.8	Romania	0.0
China	0.5	Russian Federation	0.3
Croatia	0.5 (0.0 for bus drivers and youth under 24 years old)	Singapore	0.8
Czech Republic	0.0	Slovak Republic	0.0
Denmark	0.5	Slovenia	0.5
Estonia	0.2	South Africa	0.5 (0.2 for professional drivers)
Finland	0.5	South Korea	0.52
France	0.5	Spain	0.5
Georgia	0.0	Sweden	0.2
Germany	0.5	Switzerland	0.5
Greece	0.2	Thailand	0.5
Hungary	0.0	Turkey	0.5
Iceland	0.5	Turkmenistan	0.3
Ireland	0.8	United Kingdom	0.8
Israel	0.5	United States	0.8
Italy	0.5	Uruguay	0.3
Japan	0.3	Zimbabwe	0.8

Social attitudes about drinking and driving vary considerably among countries and are closely related to cultural views about both activities. These views influence laws on impaired driving, compliance with such laws, and their enforcement.

Due to the high social cost associated with alcohol-impaired driving, there is currently a trend to make BAC levels more stringent in many countries (Assum, 2002; Wagenaar et al., 2007). There is evidence that such reductions may serve to discourage more individuals from drinking and driving.

Although these changes may have some influence in reducing impaired driving among the

population at-large, studies show that the so-called “hard-core” drunk drivers and recidivist drunk drivers may be entirely indifferent to BAC level legislation. Thus, other strategies targeting this group may need to be developed (Simpson, Beirness, Robertson, Mayhew, & Hedlund, 2004; Simpson, Mayhew, & Beirness, 1996; Williams, McCartt, & Ferguson, 2007). For example, a lower permissible BAC level or even a 0.0 mg/ml level, coupled with harsher penalties, may be indicated for individuals who have been convicted of drunk driving offences (Hingson, Heeren, & Winter, 1998; The Century Council, 2004).

Prevention, enforcement, and punitive measures

BAC legislation—like any other policy measure applied by itself—cannot be expected to change behaviors and reduce harm in isolation. Research suggests that factors such as the increased enforcement of BAC laws and raised public awareness about the dangers of impaired driving are in part responsible for decreases in related offenses and can thus enhance the effectiveness of such legislation (Apsler, Char, Harding, & Klein, 1999; Bartl & Esberger, 2000; Jones & Lacey, 2001; Kaplan & Prato, 2007; Kruger & Vollrath, 2004; Mann et al., 2001; The Century Council, 1998). Education efforts to achieve changes in awareness and behavior are necessary adjuncts to implementing laws on BAC (MODULE 1: Alcohol Education). For example, public education campaigns that promote awareness about local BAC limits have shown positive results (e.g., Blomberg, 1992). Such campaigns have been implemented through governments, advocacy groups, traffic safety organizations, and also through the beverage alcohol industry and related organizations, such as social aspects organizations and trade associations.

Consistent and visible enforcement is another powerful deterrent to impaired driving. Enforcement exists in a number of forms—including breath testing (restricted and random), sobriety checkpoints, police patrols, and officer training (e.g., British Medical Association, 1996; GRSP, 2007; Mathijssen & Wesemann, 1992; Stewart & Sweedler, 1997). Of countries that report the use of random breath tests, however, only 23% frequently rely on this measure, while 32% apply it sometimes, and 16% employ it rarely (WHO, 2004, 2009). Thirty percent of countries do not use random breath tests at all to enforce BAC legislation. Further analysis shows that countries with limits in the lower and middle ranges are more likely to apply random breath testing as an enforcement measure than countries in which BAC limits are higher (0.6 mg/ml and above).

Enforcement of BAC level legislation can occur on the spot where impairment is suspected or an accident has occurred but need not be restricted to the roadside. An additional relevant location for enforcement can be the hospital emergency room. Studies point to the fact that few drivers admitted to the hospital after a traffic crash involving alcohol are actually arrested or punished even when laboratory evidence shows their BAC level exceeds

the legal limit (Cydulka, Harmody, Barnoski, Fallon, & Emerman, 1998; Goldman, Harchelroad, & Knapp, 1998; Purssell et al., 2004).

The type and severity of punishment for convicted impaired drivers also varies widely. Punitive measures range from mandatory educational programs to monetary fines—which often rise with multiple convictions or are relative to the income of the offender (Stewart, 2000)—to jail sentences and automatic license suspension. In some countries, the appropriate penalty is determined by the level of an offender's BAC (International Center for Alcohol Policies, 2002; Österberg & Karlsson, 2003; Rehn, Room, & Edwards, 2001). License suspension is often an immediate administrative action without judicial procedures and is intended as a rapid and effective response to public danger (Apsler et al., 1999; Wagenaar & Maldonado-Molina, 2007). Other approaches include visits to morgues or hospitals to view and speak with victims of drink-driving crashes or their relatives. In the case of recidivist drunk drivers, those who are repeat offenders, ignition interlock devices may be used in their automobiles, which require that a breath test be taken to start the engine (Beirness, 2001; Roth, Voas, & Marques, 2007; The Century Council, 2004; Voas, Blackman, Tippetts, & Marques, 2002).

Conclusion

The establishment of maximum BAC levels and measures to ensure compliance and enforcement has been shown to reduce the incidence of crashes caused by impaired drivers. However, government commitment to the identification and implementation of country-specific solutions to deter impaired driving is a crucial factor. Without effective legislation and consistent government support these and other measures may have little long-term impact.

Setting maximum BAC levels should be perceived as a means of reducing harm associated with alcohol consumption. Laws on maximum BAC levels are an important component in a country's overall strategy toward drinking and driving. However, there is much that can be done outside of strict legislative and punitive measures. For example, public education campaigns, implemented through a

variety of channels, are useful in raising awareness about the dangers of drunk driving, as well as about BAC levels and legal limits for drivers. Without enforcement by local authorities and police and a commitment to punishing the guilty, legislation on impaired driving is virtually meaningless. Unless offenders are effectively deterred, impaired driving is not likely to decrease.

POLICY OPTIONS: Blood Alcohol Concentration Limits

In developing policies and approaches, consideration of a number of key elements is required. While some may be necessary at a minimum and under most conditions, others may not be appropriate in all cases, or may be difficult to implement. The list below offers a menu of areas that need to be addressed, based on effective approaches that have been implemented elsewhere.

Policies

Development of clearly defined maximum legal blood alcohol concentration (BAC) limit.

- Consideration of best available evidence on the relationship between BAC and risk for harm.
- Attention to cultural views on drinking and driving and palatability of policy measures (see also MODULE 15: Drinking and Driving).
- Internationally, BAC levels range from 0.0 mg/ml to 0.8 mg/ml.

Thresholds for BAC may vary depending on the type of vehicle or mode of transportation.

- Lower thresholds or a BAC limit of 0.0 mg/ml may be set for operators of commercial vehicles (e.g., buses, trucks, taxis) or for airline and ship pilots and train operators.
- BAC limits for recreational vehicle use (e.g., snowmobiles, powerboats) may be considered.

BAC levels may also vary with drivers' age. Legal BAC limits for young or inexperienced drivers may be set at lower levels than for the general population.

Education and prevention

Create awareness around drinking and driving and BAC.

- Provide information on risks of drinking and driving.

- Ensure knowledge among population of BAC limits and penalties for non-compliance.
- Engage broad range of partners in disseminating messages, including government authorities, police, retail and hospitality industry, advocacy groups, industry groups, schools.
- Special measures such as ignition interlock devices for repeat drunk drivers.

Ensure availability of alternative transportation or access to designated drivers (see also MODULE 15: Drinking and Driving).

Enforcement and punitive measures

Availability of consistent and visible enforcement.

- Training of police and provision of adequate resources to enforce BAC legislation.
- Use of measures including breath testing (restricted and random, depending on acceptability), sobriety checkpoints.
- Awareness of enforcement among population.
- Enforcement may be implemented on-site or elsewhere—e.g., in emergency rooms.

Implementation of well-defined punitive measures.

- Punishment may depend on level of BAC and degree of infraction.
- More severe penalties may apply to repeat offenders.

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