

BLOOD ALCOHOL CONCENTRATION

Blood Alcohol Concentration (BAC) is the amount of alcohol in the bloodstream. It is measured in percentages. For instance, having a BAC of 0.10 percent means that a person has 1 part alcohol per 1,000 parts blood in the body.

In studies of alcohol-related crashes, reaction time, tracking ability, concentrated attention ability, divided attention performance, information process capability, visual functions, perceptions, and psycho-motor performance, impairment in all these areas was significant at blood concentrations of 0.05 percent. Impairment first appeared in many of these important areas of performance at blood alcohol concentrations of 0.02 percent, substantially below the legal standard in most States for legal impairment, which is 0.08 percent. BAC can be measured by breath, blood, saliva or urine tests.

The public most commonly associates BAC with drunk driving. However, it is more accurate to refer to ***alcohol impaired driving*** because **one does not have to be drunk (intoxicated) to be demonstrably impaired**. Driving skills, especially judgment, are impaired in most people long before they exhibit visible signs of drunkenness. While most States define legal impairment for purposes of driving at a BAC of 0.08 percent or higher, alcohol may cause deterioration in driving skills at 0.05 percent or even lower. Alcohol depresses the central nervous system, causing slowed reactions, and one's ability to drive is affected long before a BAC of 0.08 percent is reached.

Factors that will affect the BAC in a person:

- How much alcohol you drink.
- How fast you drink. The quicker you drink, the higher your peak BAC will be. The liver gets rid of alcohol at the average rate of one drink per hour (12 oz. beer, 5 oz. wine, 1 shot of distilled liquor). If a person drinks faster than this, the remainder will circulate in the blood stream until the liver can get rid of it.
- Body weight. Heavier people will be less affected by the same amount of alcohol than lighter people. They have more blood and water in their bodies in which to dilute the alcohol.
- Food in the stomach. When there is food in the stomach, alcohol is absorbed slower into the blood stream. The BAC rises more rapidly in those who drink on an empty stomach, because there is no food to slow the speed the alcohol is absorbed into the blood.
- The type of alcohol you drink. The stronger a drink is (the higher the alcohol concentration, distilled alcohol first, wine second, beer third) the more quickly it is absorbed. This partially explains why hard liquor has more of an apparent "kick" than wine or beer.
- Type of mixer used. Water and fruit juices mixed with alcohol slow the absorption process, while carbonated beverages will speed it up. Carbon dioxide speeds the alcohol through the stomach and intestine into the bloodstream, creating a rapid rise in BAC.
- Temperature of the drink. Warm alcohol is absorbed quicker than cold alcohol.
- If you are male or female. Women reach higher BAC's faster because they have less water in their bodies and more adipose tissue (fat), which is not easily penetrated by alcohol. Therefore, a man and woman, with all other factors being equal, both drinking the same amount of alcohol will have different BAC levels. Hers will be higher. A woman's menstrual cycle will also affect her rate of absorption. They will experience their highest BAC's pre-menstrually. In addition, there is also evidence that a woman taking birth control pills, will absorb alcohol faster, resulting in higher BAC levels.

The effects of alcohol

Intoxication: how it happens

As the alcohol reaches your stomach, some of it is absorbed and enters the bloodstream immediately. However, most of it passes on into the small intestine where it is absorbed and goes eventually into the bloodstream. Approximately 90% of it leaves the body after being processed by the liver. This organ is able to process alcohol at approximately one standard drink per hour.

If you have only one drink per hour, the liver can keep the body's blood alcohol concentration at a relatively safe level. However, if you have more than one drink per hour the liver cannot keep up its job of processing the alcohol and the percentage of alcohol in the blood begins to rise.

As alcohol builds up in the body, the activity of the brain, heart, and lungs may slow down. *Early effects of alcohol consumption include impaired judgment, loss of self-control, and lessening of inhibitions. As more alcohol reaches the brain, the person's physical abilities become significantly impaired and coordination is lost.*

What it takes to become impaired: blood alcohol concentration

The amount of alcohol in your bloodstream is called Blood Alcohol Concentration (BAC). It is measured in "milligrams percent" or "mg %". In most states, drinkers are presumed to be legally impaired if they have a blood alcohol concentration of 0.08% or higher. This is the same as one drop of alcohol in 1,200 drops of blood. While this may seem a small amount to worry about, a blood alcohol concentration of 0.30 can cause a person to go into a coma, while a blood alcohol concentration level of 0.40 could kill you.

In practical terms it is difficult to assess someone's blood alcohol concentration without the use of a Breathalyzer.

Standard Drink Comparison

12 ounces Beer with 5% Alcohol volume = 0.6 ounces alcohol	1 1/2 ounces Highball with 40% Alcohol volume = 0.6 ounces alcohol	5 ounces Wine with 12% Alcohol volume = 0.6 ounces alcohol
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All contain approximately 0.6 ounces of alcohol and will have equal effect on the body.

Different effects for different people

While intoxication is caused by unacceptable levels of blood alcohol concentration, each person will be affected differently. Many factors may influence how quickly alcohol affects you:

Amount of alcohol

“Double-strength” drinks and servings made with more than one type of liquor typically contain more alcohol than Standard Drinks. Distilled liquor, which is highly concentrated alcohol, enters the blood-stream faster than beer and wine, although their alcohol content is equivalent.

Food consumption

Food only **slows** the absorption of alcohol into the blood-stream. On an empty stomach, alcohol reaches the brain in a few minutes and begins to affect behavior and coordination. After a full meal, alcohol can take longer to reach the brain. **Food does not absorb the alcohol.** It merely slows the speed at which alcohol is absorbed. Fatty foods are especially effective in slowing down the alcohol absorption process. As fatty foods are more difficult to digest, they remain in the stomach longer than other types of food. The effect of the alcohol still occurs but at a slower rate.

Tolerance to alcohol

Experienced drinkers develop tolerance to alcohol. After prolonged regular drinking the liver breaks down alcohol more efficiently. Also, brain cells may become less sensitive to alcohol. In a person with high tolerance it takes more alcohol to produce signs of visible intoxication. **Blood alcohol concentration, however, is determined by the amount of alcohol and is not affected by experience.**

Other drugs

Many common drugs (both legal prescription/ over the counter and

illegal) impair the user and increase the effects of alcohol. Using alcohol with other drugs can be very dangerous to a person's health and safety.

Fatigue and stress

Physical, mental, or emotional fatigue and stress make a person much more susceptible to the effects of alcohol.

Body type

An overweight person generally has a higher blood alcohol concentration than a muscular person who weighs the same and drinks the same amount of alcohol. This is because muscle tissue has more blood to dilute the alcohol.

Gender

A woman will usually have a higher blood alcohol concentration than a man of the same weight if they drink the same amount of alcohol. This is because women generally have more body fat than men. Women have less muscle tissue, and thus less blood, to dilute the alcohol.

Mood

Alcohol usually exaggerates moods. A person who is depressed will likely become more depressed when drinking.

General health

Healthy people break down alcohol faster than those in poor health. Their livers work more efficiently.

Carbonation and temperature

Carbon dioxide causes pressure in the stomach which moves alcohol into the small intestine faster where it is quickly absorbed. Warm drinks enter the bloodstream faster than cold drinks.

Alcohol and body temperature

Alcohol is a depressant, not a stimulant. It causes the pores in the skin to open, thereby lowering body temperature. As a result, alcohol contributes to deaths caused by hypothermia.

One for the road

Having a drink for the road or finishing your last drink quickly is a bad idea. *Alcohol is absorbed into the blood stream slowly and is eliminated even slower. Even if you don't feel impaired your BAC may be still*

rising. While driving home the effects of alcohol may suddenly “hit you” and you may now be an “impaired driver”.

Blood alcohol content chart

The following chart outlines the typical blood alcohol content of people of varying weight based on the number of drinks they have consumed. For example, after one Standard Drink a person weighing 150 lbs. would have a blood alcohol content of approximately .029. It would be safe to serve this person. After two drinks that person would have a blood alcohol content of .058 and care would have to be taken about further service as they would be approaching their limit. By three drinks, the person would be legally impaired.

WARNING: Some illegal drugs (marijuana) and prescription medicine (e.g., cough syrups) can increase impairment levels by as much as five times. In this table, 1 drink = 12 oz. beer or 1 1/2 oz. liquor or 5 oz. wine.

Approximate BAC

<i>Drinker's Weight</i>	<i>Number of Drinks Consumed</i>				
	1	2	3	4	5
100 lbs.	.043	.087	.130	.174	.217
125 lbs.	.034	.069	.103	.139	.173
150 lbs.	.029	.058	.087	.116	.145
175 lbs.	.025	.050	.075	.100	.125
200 lbs.	.022	.043	.065	.087	.108
225 lbs.	.019	.039	.058	.078	.097
250 lbs.	.017	.035	.052	.070	.087

How to use the chart:

1. Find the column with number of drinks.
2. Find the line that matches the patron’s weight.
3. The number at the point where the column and the line intersect is the estimated blood alcohol content.
4. Deduct from the estimated blood alcohol content the number in the box below that is next to the number of hours since the first drink. This will compensate for the body’s elimination of alcohol.

1 hour .015	2 hr .03	3 hr .045	4 hr .06	5 hr .075	6 hr .09
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If Blood Alcohol Content is .05 or more, driving is unsafe.
Over .08 driving is illegal.

Sobering facts about sobering up

Drinking coffee may increase alertness to some extent, but does not improve the body's ability to function — it only creates a wide-awake drunk.

Exercising and dancing may inspire sweating — but do little to sober a person up. Alcohol is eliminated by the liver at a relatively fixed rate.

Cold showers may temporarily affect alertness, but they do not influence the amount of impairment caused by alcohol.

Eating food while drinking slows the absorption of alcohol, but eventually the alcohol will be absorbed and impairment will occur.

Time is the only way to sober up. Alcohol is removed from the bloodstream by the liver at a relatively constant rate of 15 mg% (.015%) every hour or 1 drink per hour.

Reality check:

It takes a long time to sober up.

A person with a blood alcohol concentration of .08% takes more than 5 hours to become completely sober.

Effects of Alcohol Intoxication

- **General Effect**
Alcohol is a DOWNER or DEPRESSED that reduces activity in the central nervous system. The alcohol intoxicated person exhibits loose muscle tone, loss of fine motor coordination, and often has a staggering "drunken" gait.
- **Eyes**
The eyes may appear somewhat "glossy" and pupils may be slow to respond to stimulus. At high doses pupils may become constricted.
- **Vital Signs**
At intoxicating doses, alcohol can decrease heart rate, lower blood pressure and respiration rate, and result in decreased reflex responses and slower reaction times.
- **Skin**
Skin may be cool to the touch (but the user may feel warm), profuse sweating may accompany alcohol use.
- **Observation**
Loose muscle tone, loss of fine motor coordination, odor of alcohol on the breath, and a staggering "drunken" gait.

Specific Effects

(related to the (BAC) Blood Alcohol Concentration)

The effects of alcohol intoxication are greatly influenced by individual variations among users. Some users may become intoxicated at a much lower Blood Alcohol Concentration (BAC) level than is shown.

- 0.02-0.03 BAC: No loss of coordination, slight euphoria and loss of shyness. Depressant effects are not apparent.
- 0.04-0.06 BAC: Feeling of well-being, relaxation, lower inhibitions, sensation of warmth. Euphoria. Some minor impairment of reasoning and memory, lowering of caution.
- 0.07-0.09 BAC: Slight impairment of balance, speech, vision, reaction time, and hearing. Euphoria. Judgment and self-control are reduced, and caution, reason and memory are impaired.
- 0.10-0.125 BAC: Significant impairment of motor coordination and loss of good judgment. Speech may be slurred; balance, vision, reaction time and hearing will be impaired. Euphoria. It is illegal to operate a motor vehicle at this level of intoxication.

- 0.13-0.15 BAC: Gross motor impairment and lack of physical control. Blurred vision and major loss of balance. Euphoria is reduced and dysphoria is beginning to appear.
- 0.16-0.20 BAC: Dysphoria (anxiety, restlessness) predominates, nausea may appear. The drinker has the appearance of a "sloppy drunk."
- 0.25 BAC: Needs assistance in walking; total mental confusion. Dysphoria with nausea and some vomiting.
- 0.30 BAC: Loss of consciousness.
- 0.40 BAC and up: Onset of coma, possible death due to respiratory arrest.

Sources:

Prevention Resource Guide: Impaired Driving (1991) MS434 Safer Streets Ahead (1990) PH292.

Serving it right

http://www.servingitright.com/jsp-public/licensee/2_the_effects_of_alcohol.htm

University of Indiana <http://www.indiana.edu/~adic/effects.html>