

# Health Effects of Alcohol

## Lesson 5.4

### Essential Question

How does consuming alcohol affect physical, mental and emotional, and social health?



### Key Terms

alcohol  
alcohol poisoning  
alcohol use disorder (AUD)  
blood alcohol concentration (BAC)  
depressant  
driving under the influence (DUI)  
fetal alcohol spectrum disorders (FASD)  
hangover  
inhibition

### Learning Outcomes

Look for the skills icon  to practice health skills.

After studying this lesson, you will be able to

- 5.4-1** explain the characteristics of alcohol.
- 5.4-2** assess how alcohol affects the brain and other parts of the body.
- 5.4-3** analyze the mental, social, and legal consequences of alcohol use.

### Reading and Notetaking Activity

In what ways is drinking alcohol harmful to your health? Before reading the lesson, write a two-paragraph essay explaining some health effects of alcohol use. Consider how alcohol affects physical, mental and emotional, and social health. After you finish reading, consider what information you might add to your essay. Share your essay and any additions with a partner.



### Warm-Up Activity

#### Alcohol Underage

**Access Information** Years ago, the drinking age for alcohol was lower in the United States. In some states, people as young as 18 years old could drink. This age was raised to 21 due to research about how alcohol affects the brain.

Using reliable and valid resources, research reasons the drinking age was raised to 21. Make sure your resources are credible. Then draw a person and label their body with the health consequences of drinking alcohol before age 21. On the outside of the body, list risk factors for drinking alcohol before age 21.

## 5.4-1 Understanding Alcohol

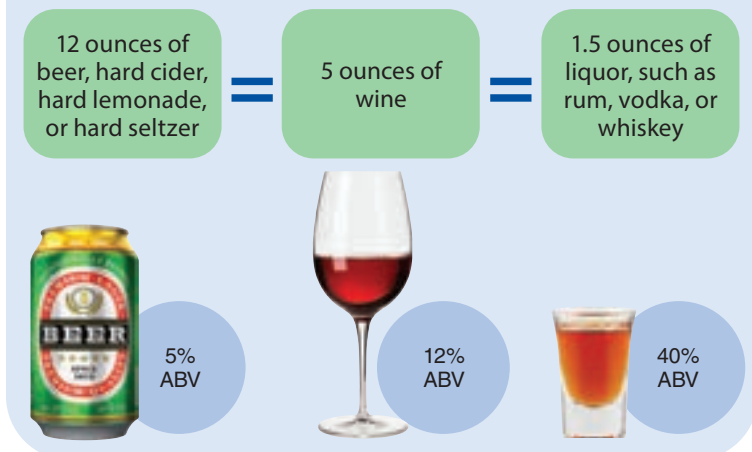
In the United States, you must be 21 years of age to buy alcohol. Some teens may not understand why this age limit exists. After all, at 18 years of age, you can vote in a presidential election or join the military.

Alcohol is the third leading cause of preventable death in the US. Alcohol use can be extremely dangerous. An estimated one in every five deaths of people ages 20 to 49 in the United States is due to excessive alcohol use. Alcohol use also contributes to the deaths of more than 4,300 Americans under the age of 21 each year.

**Alcohol** is an addictive drug that changes brain function. It has large effects on the body. It also affects thinking and behavior.

**alcohol** addictive depressant with the active ingredient ethanol; alters brain function

## What Counts as One “Standard Drink” of Alcohol?



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**Figure 5.4.1** Alcoholic drinks contain different amounts of pure alcohol. The amount is labeled as *alcohol by volume (ABV)*. ABV describes the percentage of a drink’s volume that is alcohol. The label on an alcoholic drink should list its ABV. **How many ounces of pure alcohol are in one standard drink?**

The active ingredient in alcohol is *ethanol*, or pure alcohol. Ethanol is also a component of gasoline. An alcoholic drink is any drink that contains at least 0.6 ounces (14.0 grams) of pure alcohol.

Different alcoholic drinks have different percentages of pure alcohol (**Figure 5.4.1**). A drink is measured by the amount of alcohol. It is not determined by the amount of liquid. This means that one standard drink can be different sizes.

When someone drinks alcohol, the alcohol passes from the stomach into the small intestine. It is quickly absorbed into the bloodstream and spreads throughout the body.

Drinking alcohol affects every single cell in the body. This includes cells in the muscles and brain (**Figure 5.4.2**).

## Blood Alcohol Concentration (BAC)

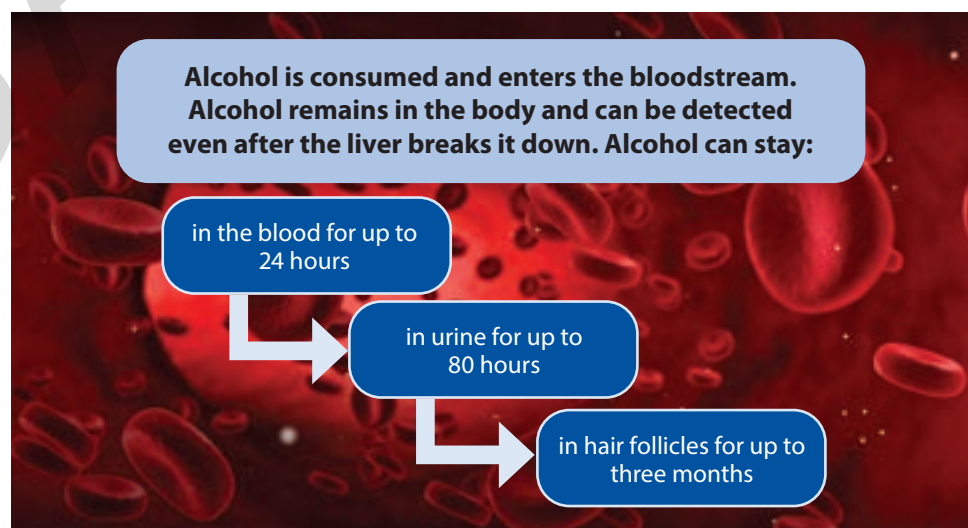
Once a person drinks alcohol, the alcohol stays in the body until the liver can break it down. Generally, alcohol leaves the body at an average rate of one standard drink per hour.

When someone drinks a lot of alcohol in a short period, the body cannot break down the alcohol fast enough. Alcohol builds up in the bloodstream. The measure of alcohol in the blood is **blood alcohol concentration (BAC)**.

BAC compares the amount of alcohol in a person’s body to the amount of blood. For example, a BAC of 0.08% means there are 8 parts alcohol to 10,000 parts other blood components.

**blood alcohol concentration (BAC)**  
percentage of alcohol in a person’s blood

**Figure 5.4.2** Since alcohol is absorbed into the blood, it goes throughout the body. This means alcohol can be found in various body parts up to three months after consumption.



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# Local and Global Health

## Consequences of Alcohol Use

According to the World Health Organization, alcohol use causes 3 million deaths each year. This means 5.3 percent of deaths worldwide are caused by alcohol use. Among people ages 20–39, 13 percent of deaths worldwide are caused by alcohol use.

Alcohol use contributes to more than 200 different diseases and injuries. These include deaths caused by the following:

- heart diseases, such as stroke
- cancer, including breast, colorectal, and liver cancer
- diabetes, pancreatitis, and tuberculosis
- unintentional injuries, including drowning, poisoning, and motor vehicle accidents

- intentional injuries, including self-harm and violence

Many countries with the lowest rates of death caused by alcohol are in the Middle East. These include Iran, Syria, and Saudi Arabia. Many countries with the highest rates of death caused by alcohol are in Eastern Europe or Central Asia. These include Russia, Ukraine, and Mongolia.

In addition to physical consequences, alcohol use can have negative social consequences. For example, alcohol use can harm family members, friends, coworkers, and strangers. It can also harm a country's economy.



### Practice Your Skills

#### Access Information

In a small group, choose one health condition related to alcohol use. This can relate to physical, mental and emotional, or social health. Research this condition using reliable resources. Describe how it relates to alcohol.

Then research how common this health condition is in the US and two other countries. What factors do you think explain this difference? What can people do to reduce their risk for this health condition? Share your findings with the class.

People who have a BAC of 0.08% or higher are legally impaired. This is called being intoxicated or drunk. About two to four alcoholic drinks cause a BAC of 0.08%, depending on the factors listed in **Figure 5.4.3**.

## Factors Affecting BAC

Factor	Explanation
<b>Body weight</b>	The same amount of alcohol affects people who weigh less more than people who weigh more. Someone who weighs more has more water in the body. This water lowers BAC. This is one reason alcohol can have more impact on females.
<b>Biological sex</b>	Females often feel the effects of alcohol more quickly and strongly. They also have a higher BAC. Muscle tissue absorbs alcohol more easily than fat. Females typically have more fat and less muscle. This means alcohol is not absorbed as easily and becomes more concentrated. In addition, females have lower levels of an enzyme that processes alcohol.
<b>Food consumption</b>	When a person drinks alcohol while or shortly after eating, BAC increases more slowly. This is because the body digests alcohol as it digests food. This gives the liver more time to break down alcohol, causing a lower BAC. The food consumed also affects BAC. It takes longer to process foods high in fat. This slows the absorption of alcohol. In one study, people who drank alcohol after eating a full meal took three times longer to absorb alcohol compared to those who drank on an empty stomach.
<b>Ethnicity</b>	Ethnicity may also influence BAC. Some research suggests that up to 50 percent of people of Asian heritage have difficulty processing alcohol. This is caused by a difference in an enzyme that processes alcohol. This can mean the liver processes alcohol more slowly, causing a higher BAC.

**Figure 5.4.3** Many different factors can affect a person's BAC.

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## Patterns of Alcohol Consumption

Drinking alcohol can have serious effects on a person's body, decisions, and future. Some people should not drink alcohol under any circumstances. This includes anyone under the age of 21. It also includes people who are or may be pregnant, people who are driving or operating equipment, and people taking certain medications. People who cannot control their alcohol use should not drink alcohol.

Adults who decide to drink alcohol need to consider the harmful effects. Certain patterns of alcohol use can influence a person's risk (Figure 5.4.4).

### 5.4-2 Physical Effects of Alcohol

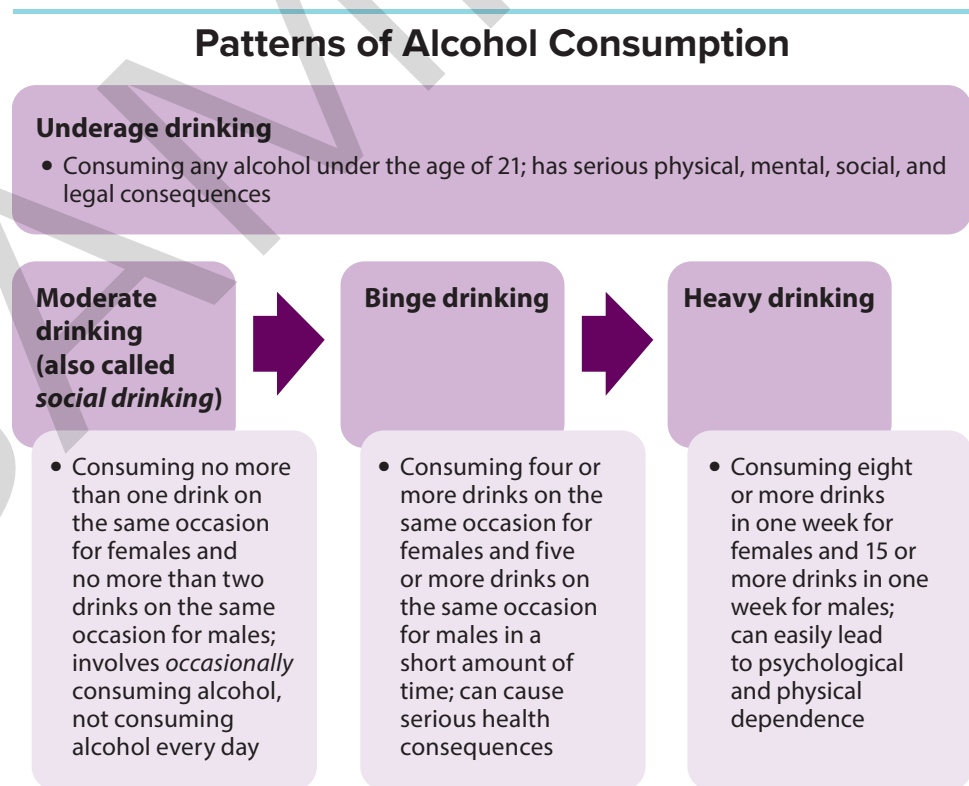
Alcohol affects every organ and body system. It can lead to serious and even life-threatening consequences.

#### Effects on the Brain

Alcohol has immediate and long-term effects on the brain. It is a type of drug called a **depressant**. Depressants slow down the nervous system, including the brain. Alcohol changes levels of certain *neurotransmitters*, or chemicals that affect body processes and cognition. These changes affect thinking and behavior.

**depressant** substance that slows down the nervous system, including the brain

**Figure 5.4.4** Moderate drinking can lead to binge drinking or heavy drinking. Underage drinking at any rate has serious consequences. *What groups of people should not drink alcohol under any circumstances?*



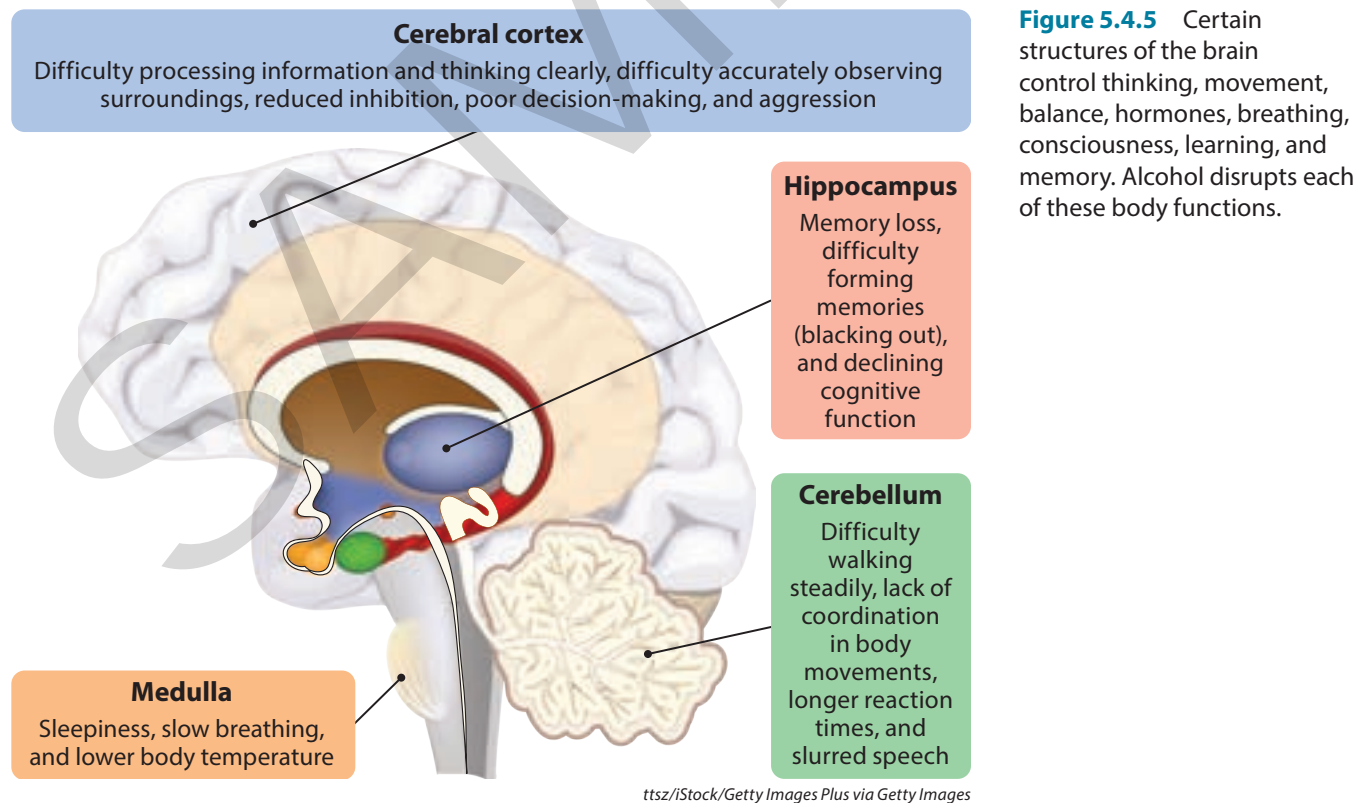
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## Immediate Effects

As soon as alcohol reaches the brain, it affects parts of the brain in different ways (Figure 5.4.5):

- **Cerebral cortex:** The cerebral cortex controls thinking. Alcohol reduces the ability to process information. This makes it difficult to think clearly and accurately see surroundings. Alcohol decreases **inhibition**, the restraint that keeps people from taking dangerous risks. Less inhibition can lead to poor decision-making and aggression.
- **Cerebellum:** Alcohol disrupts the cerebellum, which controls movement and balance. Alcohol can make it difficult to walk steadily. It can also make it hard to coordinate other body movements. This leads to slurred speech and longer reaction times. Coordination issues can lead to accidents, including motor vehicle accidents and falls.
- **Medulla:** The medulla controls automatic functions, such as breathing and consciousness. Alcohol disrupts the medulla. This causes sleepiness, slow breathing, and lower body temperature. Large amounts of alcohol can cause breathing to slow dramatically. It can also cause body temperature to drop. This can lead to life-threatening health conditions. It can even lead to death.
- **Hippocampus:** The hippocampus is linked to learning and memory. Alcohol interferes with forming memories. A lot of alcohol can lead to memory loss. This is often called *blacking out*. Long-term alcohol use increases the risk of *dementia*. Dementia is a neurological condition with memory loss and declining cognitive function.

**inhibition** psychological restraint that keeps people from acting in dangerous ways



**Figure 5.4.5** Certain structures of the brain control thinking, movement, balance, hormones, breathing, consciousness, learning, and memory. Alcohol disrupts each of these body functions.



The more alcohol a person drinks, the more effects alcohol has on the brain. At low levels, alcohol usually leads to relatively minor changes. People who have had one drink may feel less inhibited. They may also speak more loudly and use more body movements. Drinking larger amounts of alcohol leads to larger changes in the brain (**Figure 5.4.6**). This is especially true when alcohol is consumed in a short period of time.

### Path to Addiction

Like nicotine, alcohol is an addictive drug. It causes changes in the brain. These can lead to physical and psychological dependence.

People who are dependent on alcohol can develop an **alcohol use disorder (AUD)**. An AUD is a type of substance use disorder. Substance use disorders are mental illnesses. People with this disorder keep using a substance despite its negative effects.

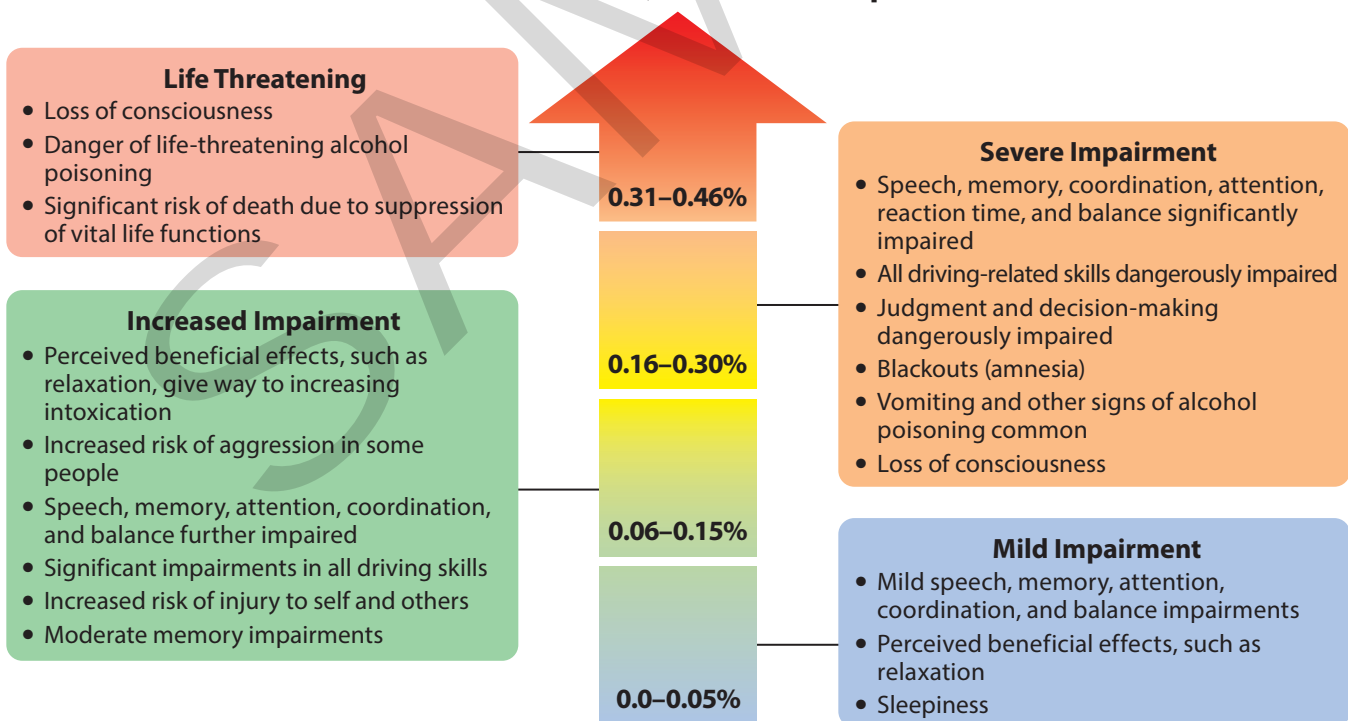
No one who drinks alcohol means to develop an addiction or substance use disorder. Addiction develops gradually, through a series of stages. During the experimentation stage, a person may drink alcohol with friends or drink occasionally. They may use alcohol to feel more relaxed or less self-conscious. They may start drinking more often.

Someone who regularly uses alcohol may not drink every day. They may drink in a predictable way. For example, they may drink on weekends, at parties, or when stressed.

As the stages progress, the brain adapts to the presence of alcohol. To counteract how alcohol slows the nervous system, the brain produces more chemicals that speed up activity.

**alcohol use disorder (AUD)** substance use disorder in which a person has an addiction to alcohol and continues to consume it despite negative health effects

## As BAC Increases, So Does Impairment



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**Figure 5.4.6** BAC increases faster for females than males and slower for heavier people than lighter people. *What condition is associated with how alcohol affects the hippocampus?*

Once this happens, the brain must readjust if the person stops drinking alcohol. This leads to unpleasant withdrawal symptoms. Even drinking small amounts of alcohol during the teen years can lead to long-term alcohol issues (Figure 5.4.7).

### Long-Term Brain Damage

Excessive alcohol use over time can have negative effects on the brain. It can also affect cognitive functioning. People who begin drinking early in life have changes in brain development. One study found that young people who binge-drink show permanent changes in their brains. This can lead to problems with learning and memory.

People who drink heavily or binge-drink regularly can have neurological conditions. These include dementia, stroke, difficulty remembering, disorientation, and drowsiness.

Binge drinking during adolescence permanently changes how the brain functions. Teens who drink heavily show damage in the white matter of the brain. This part allows information to travel between different parts of the brain. Damage to the white matter can lead to long-term issues with thinking, learning, and memory.

Alcohol use also damages the prefrontal cortex. This part of the brain controls attention, concentration, decision-making, and self-control.



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**Figure 5.4.7** Experimenting with alcohol early increases the risk of developing an alcohol use disorder later in life.

## Case Study

### The Impact of Alcohol



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Casey is 14 years old. For as long as Casey can remember, her father has drunk a lot of alcohol. He has a couple shots of whiskey after he returns home from work. He drinks several beers with dinner. Casey has stopped having friends over because she is embarrassed by her father's behavior. He speaks loudly and is clumsy when he helps clear the table. Casey's parents argue a lot. These fights happen more often after her dad lost his job due to his drinking.

Cole thought he was just going to a casual hangout with friends. Then some of his friends started drinking. Cole notices Diego, who drove him to the hangout, is drinking. By the end of the night, Cole does not feel comfortable letting Diego drive him home. Cole does not have his driver's license yet. Cole does not want to call his parents. He knows they will freak out.



### Practice Your Skills

#### Practice Health-Enhancing Behaviors

Based on their situations, how could Casey and Cole respond? What resources could help Casey manage the situation at home? What could Cole do to make sure Diego does not drive? Working in a small group, brainstorm actions or responses Casey and Cole could use to help them handle or solve their situations. Then take turns role-playing the scenarios. Demonstrate steps both teens could take.

When these parts of the brain are damaged, people find it harder to control behavior. This increases their risk of dangerous behaviors. These behaviors include drinking excessively or driving after drinking alcohol. This is one reason scientists say there is “no known safe level of binge drinking.”

## Hangover

The consequences of drinking alcohol continue even after alcohol has left a person’s body. Most people who drink heavily experience a **hangover**, or negative symptoms caused by excessive alcohol use.

The negative symptoms of a hangover are due to changes alcohol causes in the body. When alcohol reaches the brain, it causes the pituitary gland to stop producing the hormone *vasopressin*. This hormone helps the body reabsorb liquids.

Without enough *vasopressin*, liquids go straight to the bladder and leave the body. The body then removes about four times as much liquid as it consumed. This process causes dehydration. Dehydration leads to thirst, headaches, and muscle aches.

The body reacts to dehydration by moving water from other parts of the body, including the brain. When water is removed, the brain gets smaller. This places pressure on the membranes connecting the brain to the skull. This leads to headaches, dizziness, and sensitivity to light and sound.

Loss of liquid also causes the loss of essential substances. These include salt, potassium, and magnesium. Low levels of these cause tiredness, lack of coordination, and overall weakness.

Alcohol irritates the lining of the stomach by increasing stomach acid. This can lead to stomach pain, nausea, and vomiting. Alcohol use disrupts REM sleep, leading to difficulty sleeping. Alcohol use also decreases blood sugar. Decreases in blood sugar causes weakness, shakiness, difficulty concentrating, anxiety, depression, irritability, and fatigue.

**hangover** negative symptoms caused by excessive alcohol use; for example, nausea, fatigue, and headaches

**alcohol poisoning** medical emergency in which a person consumes more alcohol than the body can break down; alcohol suppresses the nervous system and body functions to dangerous levels; also called *alcohol overdose*

## Alcohol Poisoning

Alcohol slows the nervous system and various body functions. If a person has too much alcohol, these body functions can become dangerously suppressed.

**Alcohol poisoning**, also known as an *alcohol overdose*, is a medical emergency. This happens when a high concentration of alcohol in the blood has life-threatening effects (**Figure 5.4.8**). Extreme levels of alcohol, usually a BAC of 0.40% or higher, can lead to permanent brain damage. It can also lead to death. If you think someone has alcohol poisoning, get help at once by calling 911.

## Chronic Health Conditions

Alcohol use can cause chronic health conditions. Large amounts of alcohol cause fat to build up in the liver, which blocks blood flow. Over time this leads to *cirrhosis*, a buildup of scar tissue in the liver (**Figure 5.4.9**).



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**Figure 5.4.8** Alcohol poisoning can lead to loss of consciousness, low blood pressure and body temperature, and difficulty breathing. *What should you do if you think someone has alcohol poisoning?*



Heavy drinking, including binge drinking, can lead to heart conditions. These include an irregular heartbeat, high blood pressure, and heart attacks. Digestive conditions and some types of cancer are associated with alcohol use. Alcohol use is linked to cancers of the esophagus, throat, lips, and mouth.

Alcohol use during pregnancy can cause serious health conditions for the baby. These are called **fetal alcohol spectrum disorders (FASD)**.

Typically, these conditions are present at birth and include the following:

- poor growth (before and after birth)
- decreased muscle tone and poor coordination
- delayed intellectual, speech, physical, and social development
- heart conditions
- changes in facial development

### 5.4-3 Mental, Social, and Legal Consequences

Alcohol use affects a person's mental, emotional, and social health. Alcohol can also lead to legal consequences that follow a person throughout life.

#### Risky Behaviors

Alcohol affects a person's ability to process information. People who drink alcohol have trouble planning, using judgment, and thinking about the consequences of behavior. Alcohol use increases a person's likelihood of various risky behaviors.

People who have had alcohol are more likely to behave violently (**Figure 5.4.10**). Alcohol use is associated with family violence. This includes child abuse, neglect, and violence between romantic partners. Teens who drink alcohol are more likely to die by suicide or commit homicide.

#### Accidents

Alcohol slows the nervous system. This increases reaction time and disrupts coordination. It makes tasks like driving more difficult and increases the likelihood of accidents.

In the US, more than 1.5 million drivers are arrested for driving after using alcohol or drugs every year. Driving after drinking alcohol is extremely dangerous. More than 11,000 people die each year in alcohol-related motor vehicle crashes. It can hurt or kill you. It can also hurt or kill your passengers and other people.



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**Figure 5.4.9** Cirrhosis is a leading cause of death in the US. *How does alcohol use lead to cirrhosis?*

**fetal alcohol spectrum disorders (FASD)** set of health conditions that affect the baby born to a person who has consumed alcohol during the pregnancy



Bottles: Marcio Jose Bastos Silva/Shutterstock.com; Percentage: LVM/Shutterstock.com

**Figure 5.4.10** Alcohol can cause increased aggression and reduced inhibitions. This increases risk of acts of violence. *Which part of the brain can cause aggression and reduced inhibitions when impaired by alcohol?*

### driving under the influence (DUI)

operating a motor vehicle with a blood alcohol concentration at or over 0.08% for adults; for teens, this level is lower and varies by state; also known as *driving while intoxicated (DWI)* or *drunk driving*

For people 21 years of age and older, the legal BAC limit for driving is 0.08%. Adults who drive with a BAC of 0.08% or higher can be charged with **driving under the influence (DUI)** or *driving while intoxicated (DWI)*.

Drivers who receive a DUI or DWI face serious consequences. They may have their license suspended or revoked. They may do community service, pay fines, or have jail time. Penalties typically increase for repeat offenders. Someone with a revoked license may not ever get their license back, even after reapplying.

For people under 21 years of age, the legal BAC limit for driving is lower. This limit varies by state. Many states have a *zero-tolerance policy*. This means the only acceptable BAC level for people younger than 21 years of age is 0%. Penalties for violating a zero-tolerance policy vary by state.

Alcohol use is associated with other accidents and injuries. It increases a person's risk of falls, burns, homicides, suicides, unintentional firearm injuries, electrical shocks, and drowning. It also increases the likelihood of death while bicycling and swimming.

## Mental Health Effects

People may drink alcohol to make themselves feel better. Alcohol can make people feel more relaxed and calmer or less self-conscious. These feelings are from alcohol slowing down the nervous system.

The calm associated with alcohol use does not last. Once alcohol leaves the body, the feelings return.

Alcohol use can lead to behaviors a person regrets. This can increase depression or tiredness. Alcohol can worsen the symptoms and severity of mental health conditions and negative feelings.

Alcohol use can lead to mental health conditions. It can lead to an alcohol use disorder (AUD). Like other substance use disorders, an AUD makes mental health conditions worse. It also harms a person's relationships and goals.

Sometimes heavy drinking can lead people to develop mental illnesses. People who drink heavily may have an *alcohol-induced disorder*, or a health condition caused by the effects of alcohol. These include anxiety disorders, mood disorders, and sleep disorders.

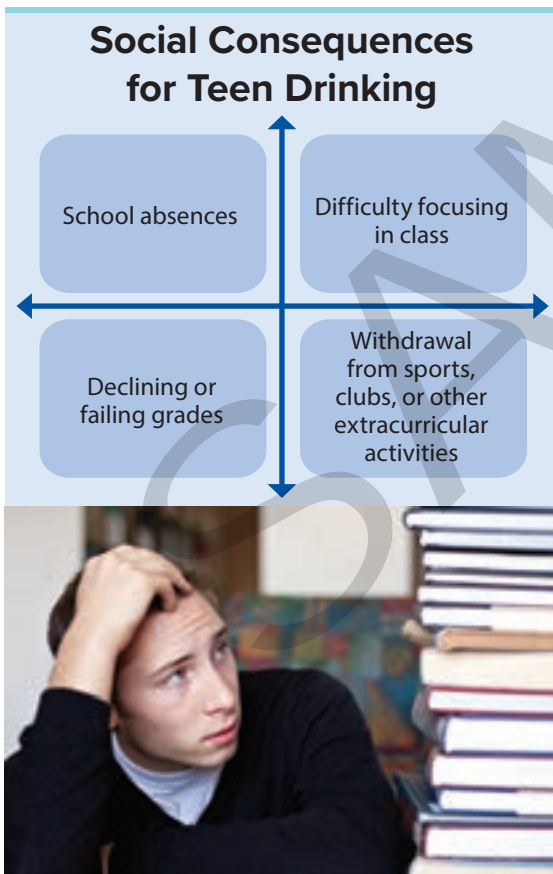
## Social Consequences

Alcohol addiction affects relationships among family, peers, and the community. It can cause strained relationships. Feelings of guilt and fear may come from disappointing loved ones. Friends may become distant if they do not want to drink alcohol. Risky behaviors can threaten personal and community safety.

Teens who drink alcohol may face consequences for future educational plans and school relationships (Figure 5.4.11). Alcohol use can cause people to miss work or be disciplined for substance use on the job.

## Legal Consequences

Laws about the use and misuse of alcohol affect individuals and the community. Alcohol use is illegal



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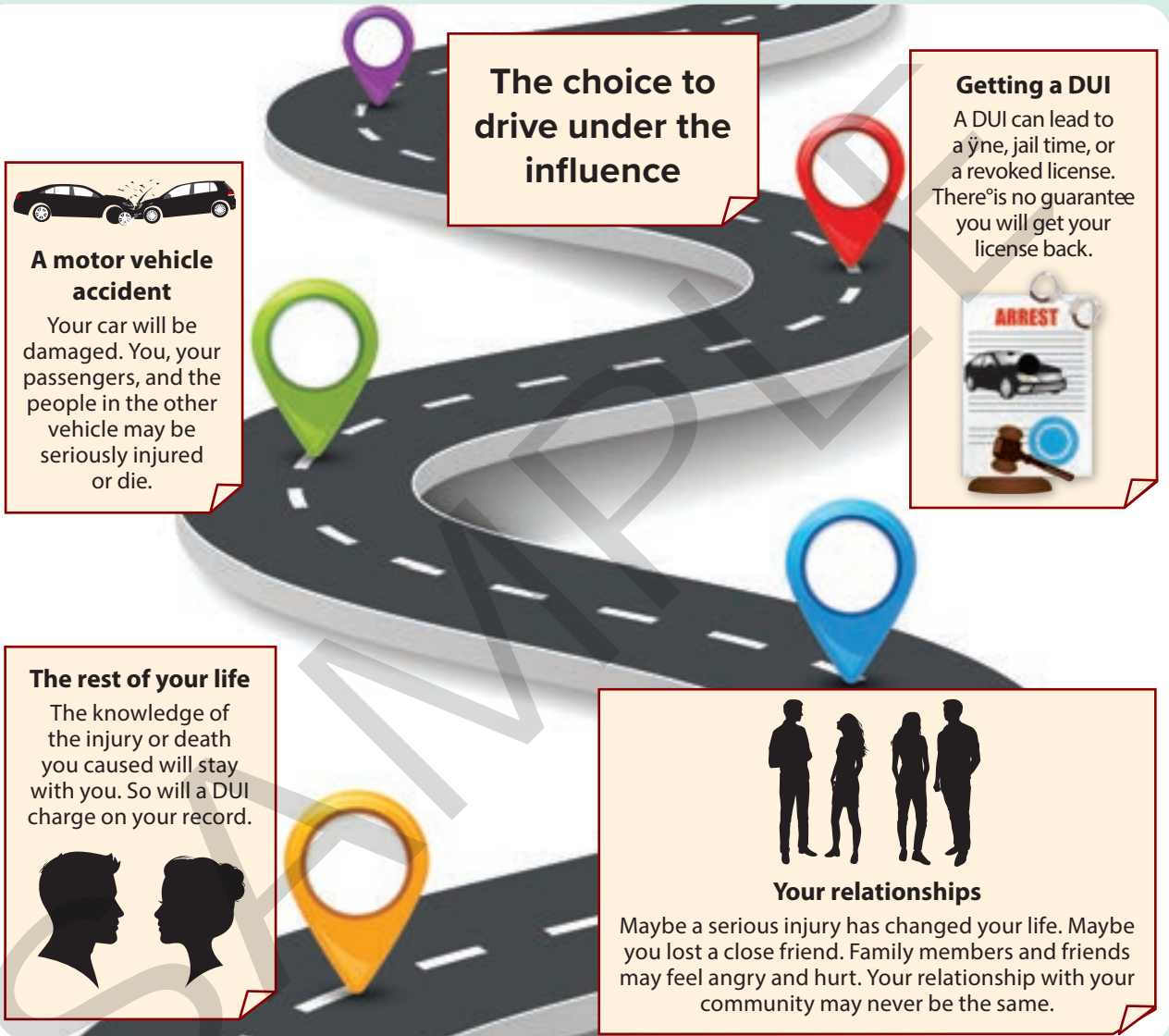
**Figure 5.4.11** Drinking alcohol can disrupt teens' success in school in many ways.

# Health Across the Life Span

## The Consequences of Drunk Driving Do Not Go Away

Teens often think about the immediate consequences of behavior. In the short-term, alcohol reduces inhibitions and causes impairment. Driving after drinking might seem like no big deal.

Driving under the influence is a behavior that has long-term consequences, however. A DUI or motor vehicle accident can change a community and each person's life.



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### Practice Your Skills

#### Advocate for Health

On your own, list the legal, social, and physical consequences a teen could face for driving under the influence, getting a DUI, and getting into a motor vehicle accident. Then share your list with a partner. Discuss why some teens drink alcohol and drive, despite the consequences.

What strategies would help teens make better choices and not drive under the influence? Think about how you could encourage teens in your school and community to avoid driving under the influence. Commit to act on one of these ideas with your partner.

for anyone younger than 21. Teens who are caught using alcohol may face legal consequences. They may have to pay a fine (as much as \$500). They may have to take a class about alcohol use and do community service. Their driver's licenses may be suspended so they cannot drive. Trying to buy alcohol, using a fake identification, or sharing alcohol with another underage person can also have legal consequences.

## Lesson 5.4 Review and Assessment

### Summary

- 5.4-1** Alcohol is an addictive drug that alters brain function. Blood alcohol concentration (BAC) is the amount of alcohol in a person's blood.
- 5.4-2** Alcohol has immediate and long-term effects on the brain. Alcohol use over time can lead to chronic health conditions.
- 5.4-3** Alcohol affects mental, emotional, and social health. It can have legal consequences that follow a person throughout life.

### Comprehend Concepts

1. Having five or more alcoholic drinks on the same occasion is called (5.4-1)
  - A. moderate drinking
  - B. binge drinking
  - C. heavy drinking
  - D. social drinking
2. What type of drug is alcohol? (5.4-2)
  - A. Vasopressin
  - B. Stimulant
  - C. Depressant
  - D. Hormone
3. Which is a mental health effect of drinking alcohol? (5.4-3)
  - A. Lasting calm
  - B. Better relationships
  - C. Relief from mental health conditions
  - D. Alcohol-induced disorders

### Critical Thinking Skills

1. Two people drank the same amount of alcohol at a party. One seems more intoxicated than the other. What are some possible causes?
2. With a partner, give examples of inhibitions. How would your behavior change if alcohol lessened these inhibitions?
3. Using reliable resources, research laws about alcohol use and misuse in your state. What penalties could a teen who drinks or buys alcohol or uses a fake identification face? How does this affect you and the community?



### Health and Wellness Skills

1. **Analyze Influences** Find a print or online advertisement for an alcoholic product or drink. Analyze and describe it to your class. Explain why the advertisement would or would not persuade teens. What strategies does the advertisement use? What skills can teens use to see through these strategies and resist the influence?
2. **Communicate with Others** In a small group, develop a 10-line rap or poem about the effects of alcohol on society. The rap or poem must be right for your target audience. It should include different types of alcohol, effects of alcohol, and reasons to stay away from alcohol. Record your rap or poem. Then share it with the class.
3. **Make Decisions** More alcohol-related deaths occur on holidays. Brainstorm reasons to explain this connection. Consider the issues of heavy drinking, binge drinking, and alcohol use disorder. Afterward, make a list of healthy decisions to avoid the risk factors you researched. Show the process behind each decision on your list.
4. **Set Goals** Write a SMART goal to help you stay alcohol-free until you are 21. This goal should be something you would like to do. It should also be something drinking alcohol would make difficult to do. Create a written or audio journal entry about how and why this goal will help you stay alcohol-free.