

HEALTH EDUCATION



HEALTH 100
VERSION 3

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Table of Contents

Acknowledgements.....	2
CHAPTER 1: Introduction to Health	6
Section 1.1 Definition and Concepts of Health.....	6
Section 1.2 Narrow Perspectives of Health.....	6
Section 1.3 Broader Perspectives of Health.....	6
Section 1.4 The Six Dimensions of Health.....	7
Section 1.5 Life Expectancy at Birth.....	8
Section 1.6 Leading Causes of Death.....	8
Section 1.7 About Determinants of Health.....	8
Section 1.8 Health Disparities.....	11
Section 1.9 Risk Factors and Levels of Disease Prevention.....	13
Section 1.10 Levels of Disease Prevention	14
Section 1.11 Behavior Change and Goal Setting.....	15
Section 1.12 SMART Goal Setting.....	17
CHAPTER 2: Psychological Health	19
Section 2.1 Physiological Needs.....	20
Section 2.2 Safety Needs	20
Section 2.3 Social Belonging	20
Section 2.4 Esteem.....	21
Section 2.5 Self-Actualization.....	21
Section 2.6 Self-Transcendence	22
Section 2.7 Mental Health	22
Section 2.8 Emotional Health.....	23
Section 2.9 Spiritual Health	24
Section 2.10 Social Health	24
Section 2.11 Factors That Influence Psychological Well-Being.....	24
Section 2.12 Developing and protecting individual attributes	27
Section 2.13 Supporting families and communities	27
Section 2.14 Supporting vulnerable groups in society	28
Section 2.15 Mental Illness	28
Section 2.16 Mood Disorders	29
Section 2.17 Depression.....	29
Section 2.18 Dysthymic Disorder	29
Section 2.19 Bipolar Disorder.....	30
Section 2.20 The Causes of Depression (depressive disorders).....	30
Section 2.21 Treating depression.....	30
Section 2.22 Coping with Depression	31
Section 2.23 Anxiety Disorders.....	31
Section 2.24 The Stigma of Mental Illness	42
CHAPTER 3: Stress Management.....	45
Section 3.1 Chronic Stress	45
Section 3.2 The Effects of Stress on the Body.....	45
Section 3.3 Stress and the Brain	45
Section 3.4 Your Bodies Response to Stress	47
Section 3.5 General Adaptation Syndrome.....	47

Section 3.6 Distress may be destructive to health.....	49
Section 3.7 Eustress	49
Section 3.8 Burnout and Stress Related Illness	49
Section 3.9 Common Causes of Stress	51
Section 3.10 Common signs and symptoms of stress	52
Section 3.11 Do women react to stress differently than men?.....	52
Section 3.12 Can Stress Affect My Health?.....	52
Section 3.13 The Effect of Stress on the Immune System	52
Section 3.14 Does stress cause ulcers? NO	53
Section 3.15 Post-traumatic stress disorder (PTSD).....	53
Section 3.16 Stress is in the Eye of the Beholder	54
Section 3.17 Managing Stress	56
Section 3.18 Coping with Stress.....	58
Section 3.19 Exercise and Stress	58
Section 3.20 Meditation and Health	59
Section 3.21 Relaxation Techniques	60
Section 3.22 Resilience	65
CHAPTER 4: Relationships and Communication	68
Section 4.1 Theories of Love.....	68
Section 4.2 THEORIES OF MATE SELECTION	72
Section 4.3 Marriage	77
Section 4.4 Cohabitation	78
Section 4.5 Marrieds and Non-Marrieds	79
CHAPTER 5: Gender and Sexuality	92
Section 5.1 Sexual Scripts	92
Section 5.2 Genital Development.....	93
Section 5.3 The Importance of Sexuality.....	94
Section 5.4 Sexual Anatomy.....	95
Section 5.5 The Sexual Response.....	96
Section 5.6 The Sexual Experience	99
Section 5.7 Sex and Gender.....	100
Section 5.8 Sexuality.....	102
CHAPTER 6: Sexual Health.....	106
Section 6.1 Sexual Health.....	106
Section 6.2 Sexuality.....	106
Section 6.3 Public Health Approach to Sexual Health.....	106
Section 6.4 Stigma.....	106
Section 6.5 Sexual Dysfunction.....	106
Section 6.6 Sexual Frequency.....	107
Section 6.7 Sex and Health	107
Section 6.8 Sexual Happiness.....	107
Section 6.9 Sexual Bias and Misconceptions.....	107
Section 6.10 Reproductive Health.....	108
CHAPTER 7: Infectious diseases and Sexually Transmitted Infections (STI's).....	131
Section 7.1 Introduction.....	131
Section 7.2 What are infectious diseases?	131
Section 7.3 Symptoms and signs of infection	132
Section 7.4 What causes infectious diseases?	132
Section 7.5 Direct person-to-person transmission of pathogens.....	133
Section 7.6 Indirect person-to-person transmission of pathogens.....	134

Section 7.7 Animal-to-human transmission of pathogens.....	136
Section 7.8 Immune Defenses Against Infectious Diseases	138
Section 7.9 Risk Factors and Levels of Disease Prevention.....	147
Section 7.10 Levels of Disease Prevention	148
Section 7.11 Sexually Transmitted Infections.....	149
Section 7.12 STD/STI Treatments.....	155
Section 7.13 STD/STI Prevention: How to Prevent STI's	157
Section 8.1 Understanding Drug Use and Addiction	161
Section 8.2 Types of Drugs	161
Section 8.3 Prescription Drugs	172
Section 8.4 Alcohol Abuse.....	176
Section 8.5 Tobacco.....	181
Section 8.7 Drug Addiction.....	186
Section 8. 7 Treatment Approaches for Drug Addiction.....	189
CHAPTER 9: Basic Nutrition and Healthy Eating	196
Section 9.1 Nutrition and Health	196
Section 9.2 Planning a Diet.....	208
Section 9.3 Popular Diets.....	217
Section 9.4 Food Supplements and Food Replacements	222
CHAPTER 10: Weight Management	227
Section 10.1 Assessing Body Weight and Body Composition.....	230
Section 10.2 Factors Contributing to Overweight and Obesity.....	233
Section 10.3 Balancing Calories and Eating Healthfully	239
Section 10.4 Body Image.....	246
CHAPTER 11: Physical Fitness.....	251
Section 11.1 Health Benefits Associated with Regular Physical Activity.....	251
Section 11.2 Health Related Components of Physical Fitness.....	253
Section 11.3 Adding Physical Activity to Your Life	256
Section 11.4 Implementing Your Fitness Plan	262
CHAPTER 12: Cardiovascular Disease, Diabetes, and Cancer.....	271
Section 12.1 Stroke.....	277
Section 12.2 Metabolic Syndrome.....	279
Section 12.3 Diabetes	287
Section 12.4 Cancer	292
CHAPTER 13: Environmental Health	305
Section 13.1 Overpopulation.....	306
Section 13.2 Air Pollution	307
Section 13.3 Climate Change	308
Section 13.4 Water	309
Section 13.5 Waste Management.....	310
CHAPTER 14: Health Care Choices.....	312
Section 14.1 Understanding your Health Care Choices.....	312
Section 14.3 Health Care Choices: The Affordable Health Care Act (ACA).....	319
Section 14.4 Health Insurance: Key Terms	321
Section 14.5 Choices in Medical Care.....	323
Section 14.6 Alternative Medical Practices	327
Section 14.7 Health Disparity	332

CHAPTER 1: Introduction to Health

In this section, readers will learn about the nature of health, health education, health promotion and related concepts. This will help to understand the social, psychological and physical components of health.

Section 1.1 Definition and Concepts of Health

In the Oxford English Dictionary health is defined as: 'the state of being free from sickness, injury, disease, bodily conditions; something indicating good bodily condition.'

Clearly, health is not quite as simple as the definition implies. The concept of health is wide and the way we define health also depends on individual perception, religious beliefs, cultural values, norms, and social class. Generally, there are two different perspectives concerning people's own definitions of health: a narrow perspective and a broader perspective.

Section 1.2 Narrow Perspectives of Health

People with a narrow perspective consider health as the absence of disease or disability or biological dysfunction. According to this view (or model), to call someone unhealthy or sick means there should be evidence of a particular illness. Social, emotional and psychological factors are not believed to cause unhealthy conditions. This model is narrow and limits the definition of health to the physical and physiological capabilities that are necessary to perform routine tasks.

According to this definition, the individual is healthy if all the body parts, cells, tissues and organ systems are functioning well and there is no apparent dysfunction of the body. Using this model people view the human body in the same terms as a computer, or mechanical device, when something is wrong you take it to experts who maintain it. Physicians, unlike behavioral experts, often focus on treatment and clinical interventions with medication rather than educational interventions to bring about behavior change.

Section 1.3 Broader Perspectives of Health

The most widely used of the broader definitions of health is that within the constitution of the World Health Organization (WHO), which defines health as: A state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity. This classic definition is important, as it identifies the vital components of health.

Well-being includes the presence of positive emotions and moods (e.g., contentment, happiness), the absence of negative emotions (e.g., depression, anxiety), satisfaction with life, fulfillment and positive functioning. In simple terms, well-being can be described as judging life positively and feeling good. Well-being is associated with numerous health-, job-, family-, and economically related benefits. For example, higher levels of well-being are associated with decreased risk of disease, illness, and injury; better immune functioning;

speedier recovery; and increased longevity. Individuals with high levels of well-being are more productive at work and are more likely to contribute to their communities. Many practitioners have expanded their focus to include wellness at the positive end of the health continuum. Wellness is being in good physical and mental health. Because mental health and physical health are linked, problems in one area can impact the other. At the same time, improving your physical health can also benefit your mental health, and vice versa. It is important to make healthy choices for both your physical and mental well-being. Remember that wellness is not just the absence of illness or stress. One can still strive for wellness even if he/she is experiencing these challenges in life. To more fully understand the meaning of health, it is important to understand each of its individual components.

Section 1.4 The Six Dimensions of Health

1.4.1 Physical

Body size and functioning; recognizing the need for physical activity, healthy foods, and adequate sleep; avoiding unhealthy habits

1.4.2 Social

Developing a sense of connection, belonging, and sustained support system; having positive relationships

1.4.3 Intellectual

Recognizing creative abilities and finding ways to expand knowledge and skills; being open-minded

1.4.4 Emotional

Coping effectively with life and expressing emotions in an appropriate manner

1.4.5 Spiritual

Having a sense of purpose and meaning in life; establishing peace, harmony, and balance in our lives

1.4.6 Environmental

Occupying pleasant, healthy, and safe environments that support wellbeing; positively impacting the quality of our surroundings (including protecting and preserving nature) Learning about the Six Dimensions of Health can help a person choose how to make wellness a part of everyday life. Wellness strategies are practical ways to start developing healthy habits that can have a positive impact on physical and mental health.

Section 1.5 Life Expectancy at Birth

Life expectancy is a measure often used to gauge the overall health of a population. Life expectancy at birth represents the average number of years that a group of infants would live if the group were to experience the age-specific death rates present in the year of birth. Differences in life expectancy among various demographic subpopulations, including racial and ethnic groups, may reflect differences in a range of factors such as socioeconomic status, access to medical care, and the prevalence of specific risk factors in a particular subpopulation.

During 1975–2015, life expectancy at birth in the United States increased from 68.8 to 76.3 years for males and from 76.6 to 81.2 years for females. During this period, life expectancy at birth for males and females was longer for white persons than for black persons. Racial disparities in life expectancy at birth persisted for both males and females in 2015, but continued to narrow.

Section 1.6 Leading Causes of Death

In 1975, the five leading causes of death were heart disease, cancer, stroke, unintentional injuries, and influenza and pneumonia. In 2015, the five leading causes of death were heart disease, cancer, chronic lower respiratory diseases, unintentional injuries, and stroke. Throughout 1975–2015, heart disease and cancer remained the top two leading causes of death.

Section 1.7 About Determinants of Health

The range of personal, social, economic, and environmental factors that influence health status are known as determinants of health.

1.7.1 Determinants of Health

What makes some people healthy and others unhealthy?

How can we create a society in which everyone has a chance to live a long, healthy life?

Determinants of health are factors that contribute to a person's current state of health. These factors may be biological, socioeconomic, psychosocial, behavioral, or social in nature. Scientists generally recognize five determinants of health of a population:

Healthy People 2020 is exploring these questions by:

- Developing objectives that address the relationship between health status and biology, individual behavior, health services, social factors, and policies.

- Emphasizing an ecological approach to disease prevention and health promotion. An ecological approach focuses on both individual-level and population-level determinants of health and interventions.
- Genes and biology: for example, sex and age
- Health behaviors: for example, alcohol use, injection drug use (needles), unprotected sex, and smoking
- Social environment or social characteristics: for example, discrimination, income, and gender
- Physical environment or total ecology: for example, where a person lives and crowding conditions
- Health services or medical care: for example, access to quality health care and having or not having insurance
- Other factors that could be included are culture, social status, and healthy child development.

Determinants of health fall under several broad categories:

Policymaking

Policies at the local, state, and federal level affect individual and population health. Increasing taxes on tobacco sales, for example, can improve population health by reducing the number of people using tobacco products.

Some policies affect entire populations over extended periods of time while simultaneously helping to change individual behavior. For example, the 1966 Highway Safety Act and the National Traffic and Motor Vehicle Safety Act authorized the Federal Government to set and regulate standards for motor vehicles and highways. This led to an increase in safety standards for cars, including seat belts, which in turn reduced rates of injuries and deaths from motor vehicle accidents.

Social Factors

Social determinants of health reflect the social factors and physical conditions of the environment in which people are born, live, learn, play, work, and age. Also known as social and physical determinants of health, they impact a wide range of health, functioning, and quality-of-life outcomes. Examples of social determinants include:

- Availability of resources to meet daily needs, such as educational and job opportunities, living wages, or healthful foods
- Social norms and attitudes, such as discrimination
- Exposure to crime, violence, and social disorder, such as the presence of trash
- Social support and social interactions
- Exposure to mass media and emerging technologies, such as the Internet or cell phones
- Socioeconomic conditions, such as concentrated poverty

- Quality schools
- Transportation options
- Public safety
- Residential segregation

Examples of physical determinants include:

- Natural environment, such as plants, weather, or climate change
- Built environment, such as buildings or transportation
- Worksites, schools, and recreational settings
- Housing, homes, and neighborhoods
- Exposure to toxic substances and other physical hazards
- Physical barriers, especially for people with disabilities
- Aesthetic elements, such as good lighting, trees, or benches

Poor health outcomes are often made worse by the interaction between individuals and their social and physical environment. For example, millions of people in the United States live in places that have unhealthy levels of ozone or other air pollutants. In counties where ozone pollution is high, there is often a higher prevalence of asthma in both adults and children compared with state and national averages. Poor air quality can worsen asthma symptoms, especially in children.

Health Services

Both access to health services and the quality of health services can impact health. Healthy People 2020 directly addresses access to health services as a topic area and incorporates quality of health services throughout a number of topic areas.

Lack of access, or limited access, to health services greatly impacts an individual's health status. For example, when individuals do not have health insurance, they are less likely to participate in preventive care and are more likely to delay medical treatment.

Barriers to accessing health services include:

- Lack of availability
- High cost
- Lack of insurance coverage
- Limited language access

These barriers to accessing health services lead to:

- Unmet health needs
- Delays in receiving appropriate care
- Inability to get preventive services
- Hospitalizations that could have been prevented

Individual Behavior

Individual behavior also plays a role in health outcomes. For example, if an individual quits smoking, his or her risk of developing heart disease is greatly reduced.

Many public health and health care interventions focus on changing individual behaviors such as substance abuse, diet, and physical activity. Positive changes in individual behavior can reduce the rates of chronic disease in this country.

Examples of individual behavior determinants of health include:

- Diet
- Physical activity
- Alcohol, cigarette, and other drug use
- Hand washing

Biology and Genetics

Some biological and genetic factors affect specific populations more than others. For example, older adults are biologically prone to being in poorer health than adolescents due to the physical and cognitive effects of aging.

Sickle cell disease is a common example of a genetic determinant of health. Sickle cell is a condition that people inherit when both parents carry the gene for sickle cell. The gene is most common in people with ancestors from West African countries, Mediterranean countries, South or Central American countries, Caribbean islands, India, and Saudi Arabia.

Examples of biological and genetic social determinants of health include:

- Age
- Sex
- HIV status
- Inherited conditions, such as sickle-cell anemia, hemophilia, and cystic fibrosis
- Carrying the BRCA1 or BRCA2 gene, which increases risk for breast and ovarian cancer
- Family history of heart disease

Section 1.8 Health Disparities

Although the term disparities is often interpreted to mean racial or ethnic disparities, many dimensions of disparity exist in the United States, particularly in health. If a health outcome is seen to a greater or lesser extent between populations, there is disparity. Race or ethnicity, sex, sexual identity, age, disability, socioeconomic status, and geographic location all contribute to an individual's ability to achieve good health. It is important to recognize the impact that social determinants have on health outcomes of specific populations.

Healthy People strives to improve the health of all groups.

To better understand the context of disparities, it is important to understand more about the U.S. population. In 2008, the U.S. population was estimated at 304 million people.

- In 2008, approximately 33%, or more than 100 million people, identified themselves as belonging to a racial or ethnic minority population.
- In 2008, 51%, or 154 million people, were women.
- In 2008, approximately 12%, or 36 million people not living in nursing homes or other residential care facilities, had a disability.
- In 2008, an estimated 70.5 million people lived in rural areas (23% of the population), while roughly 233.5 million people lived in urban areas (77%).
- In 2002, an estimated 4% of the U.S. population ages 18 to 44 identified themselves as lesbian, gay, bisexual, or transgender.

During the past 2 decades, one of Healthy People's overarching goals has focused on disparities. In Healthy People 2000, it was to reduce health disparities among Americans. In Healthy People 2010, it was to eliminate, not just reduce, health disparities. In Healthy People 2020, that goal expanded even further: to achieve health equity, eliminate disparities, and improve the health of all groups.

Healthy People 2020 defines health equity as the “attainment of the highest level of health for all people. Achieving health equity requires valuing everyone equally with focused and ongoing societal efforts to address avoidable inequalities, historical and contemporary injustices, and the elimination of health and health care disparities.”

Healthy People 2020 defines a health disparity as “a particular type of health difference that is closely linked with social, economic, and/or environmental disadvantage. Health disparities adversely affect groups of people who have systematically experienced greater obstacles to health based on their racial or ethnic group; religion; socioeconomic status; gender; age; mental health; cognitive, sensory, or physical disability; sexual orientation or gender identity; geographic location; or other characteristics historically linked to discrimination or exclusion.”

Over the years, efforts to eliminate disparities and achieve health equity have focused primarily on diseases or illnesses and on health care services. However, the absence of disease does not automatically equate to good health. Powerful, complex relationships exist between health and biology, genetics, and individual behavior, and between health and health services, socioeconomic status, the physical environment, discrimination, racism, literacy levels, and legislative policies. These factors, which influence an individual or population’s health, are known as determinants of health.

For all Americans, other influences on health include the availability of and access to:

- High-quality education
- Nutritious food
- Decent and safe housing
- Affordable, reliable public transportation
- Culturally sensitive health care providers
- Health insurance
- Clean water and non-polluted air

Throughout the next decade, Healthy People 2020 will assess health disparities in the U.S. population by tracking rates of illness, death, chronic conditions, behaviors, and other types of outcomes in relation to demographic factors including:

- Race and ethnicity
- Gender
- Sexual identity and orientation
- Disability status or special health care needs
- Geographic location (rural and urban)

Section 1.9 Risk Factors and Levels of Disease Prevention

What is a Risk Factor?

Part of learning how to take charge of one's health requires understanding risk factors for different diseases. Risk factors are things in life that increase your chances of getting a certain disease. Some risk factors are beyond your control. A person may be born with them or have exposure with no fault assigned.

Some risk factors that you have little or no control over include:

- Family history of a disease
- Sex/gender — male or female
- Ancestry

Some controllable risk factors include:

- What you eat
- How much physical activity you get
- Whether you use tobacco
- How much alcohol you drink
- Whether you misuse drugs

In fact, it has been estimated that almost 35 percent of all U.S. early deaths in 2000 could have been avoided by changing just three behaviors:

- Stopping smoking
- Eating a healthy diet (for example, eating more fruits and vegetables and less red meat)
- Getting more physical activity

A person can have one risk factor for a disease or he/she can have many. The more risk factors a person has, the more likely he/she will get the disease. For example, if people eat healthy, exercise on a regular basis, and control blood pressure, their chances of getting heart disease are less than those of diabetics, smokers, and sedentary people. To lower

your risks, take small steps toward engaging in a healthy lifestyle, and you'll see big rewards.

People with a family health history of chronic disease may have the most to gain from making lifestyle changes. You can't change your genes, but you can change behaviors that affect your health, such as smoking, inactivity, and poor eating habits. In many cases, making these changes can reduce your risk of disease even if the disease runs in your family. Another change you can make is to have screening tests, such as mammograms and colorectal cancer screening. These screening tests help detect disease early. People who have a family health history of a chronic disease may benefit the most from screening tests that look for risk factors or early signs of disease. Finding disease early, before symptoms appear, can mean better health in the long run.

Section 1.10 Levels of Disease Prevention

Prevention includes a wide range of activities — known as “interventions” — aimed at reducing risks or threats to health. You may have heard researchers and health experts talk about three categories of prevention: primary, secondary and tertiary. What do they mean by these terms?

Primary prevention aims to prevent disease or injury before it ever occurs. This is done by preventing exposures to hazards that cause disease or injury, altering unhealthy or unsafe behaviors that can lead to disease or injury, and increasing resistance to disease or injury should exposure occur. Examples include:

- Legislation and enforcement to ban or control the use of hazardous products (e.g. asbestos) or to mandate safe and healthy practices (e.g. use of seatbelts and bike helmets)
- Education about healthy and safe habits (e.g. eating well, exercising regularly, not smoking)
- Immunization against infectious diseases.

Secondary prevention aims to reduce the impact of a disease or injury that has already occurred. This is done by detecting and treating disease or injury as soon as possible to halt or slow its progress, encouraging personal strategies to prevent re-injury or recurrence, and implementing programs to return people to their original health and function to prevent long-term problems.

Examples include:

- Regular exams and screening tests to detect disease in its earliest stages (e.g. mammograms to detect breast cancer)
- Daily, low-dose aspirins and/or diet and exercise programs to prevent further heart attacks or strokes
- Suitably modified work so injured or ill workers can return safely to their jobs.

Tertiary prevention aims to soften the impact of an ongoing illness or injury that has lasting effects. This is done by helping people manage long-term, often-complex health problems and injuries (e.g. chronic diseases, permanent impairments) in order to improve as much as possible their ability to function, their quality of life and their life expectancy. Examples include:

- Cardiac or stroke rehabilitation programs, chronic disease management programs (e.g. for diabetes, arthritis, depression, etc.)
- Support groups that allow members to share strategies for living well
- Vocational rehabilitation programs to retrain workers for new jobs when they have recovered as much as possible.

Section 1.11 Behavior Change and Goal Setting

Transtheoretical Model (Stages of Change)

The transtheoretical model of behavior change, developed by Prochaska and DiClemente, assesses an individual's readiness to implement a healthier behavior and provides insight into the decision making process that leads to action. For many people, changing or modifying a behavior that is unhealthy or potentially harmful can be quite challenging. Here are the stages that lead to behavior change:

- *Precontemplation (Not Ready)* – You are not intending to take action in the foreseeable future, and can be unaware that your behavior is problematic
- *Contemplation (Getting Ready)* – You are beginning to recognize that your behavior is problematic, and start to look at the pros and cons of your continued actions
- *Preparation (Ready)* – You are intending to take action in the immediate future, and may begin taking small steps toward behavior change
- *Action* – You are making actual changes to your problem behavior by incorporating healthy choices/behaviors into your life
- *Maintenance* – You have been able to sustain action for at least six months and are working to prevent relapse into previous unhealthy behaviors

Stage 1: Precontemplation (not ready)

People at this stage do not intend to start the healthy behavior in the near future (within 6 months), and may be unaware of the need to change. People here learn more about healthy behavior: they are encouraged to think about the pros of changing their behavior and to feel emotions about the effects of their negative behavior on others.

Precontemplators typically underestimate the pros of changing, overestimate the cons, and often are not aware of making such mistakes.

One of the most effective steps that others can help with at this stage is to encourage them to become more mindful of their decision-making and more conscious of the multiple benefits of changing an unhealthy behavior.

Stage 2: Contemplation (getting ready)

At this stage, participants are intending to start the healthy behavior within the next 6 months. While they are usually now more aware of the pros of changing, their cons are about equal to their Pros. This ambivalence about changing can cause them to keep putting off taking action. People here learn about the kind of person they could be if they changed their behavior and learn more from people who behave in healthy ways.

Others can influence and help effectively at this stage by encouraging them to work at reducing the cons of changing their behavior.

Stage 3: Preparation (ready)

People at this stage are ready to start taking action within the next 30 days. They take small steps that they believe can help them make the healthy behavior a part of their lives. For example, they tell their friends and family that they want to change their behavior.

People in this stage should be encouraged to seek support from friends they trust, tell people about their plan to change the way they act, and think about how they would feel if they behaved in a healthier way. Their number one concern is: when they act, will they fail? They learn that the better prepared they are, the more likely they are to keep progressing.

Stage 4: Action (current action)

People at this stage have changed their behavior within the last 6 months and need to work hard to keep moving ahead. These participants need to learn how to strengthen their commitments to change and to fight urges to slip back. People in this stage progress by being taught techniques for keeping up their commitments such as substituting activities related to the unhealthy behavior with positive ones, rewarding themselves for taking steps toward changing, and avoiding people and situations that tempt them to behave in unhealthy ways.

Stage 5: Maintenance (monitoring)

People at this stage changed their behavior more than 6 months ago. It is important for people in this stage to be aware of situations that may tempt them to slip back into doing the unhealthy behavior—particularly stressful situations. It is recommended that people in this stage seek support from and talk with people whom they trust, spend time with people who behave in healthy ways, and remember to engage in healthy activities to cope with stress instead of relying on unhealthy behavior.

Relapse (recycling): Relapse in the TTM specifically applies to individuals who successfully quit smoking or using drugs or alcohol, only to resume these unhealthy

behaviors. Individuals who attempt to quit highly addictive behaviors such as drug, alcohol, and tobacco use are at particularly high risk of a relapse. Achieving a long-term behavior change often requires ongoing support from family members, a health coach, a physician, or another motivational source. Supportive literature and other resources can also be helpful to avoid a relapse from happening.

Section 1.12 SMART Goal Setting



Figure 1. SMART Acronym

Have you ever said to yourself that you need to “eat healthier” or “exercise more” to improve your overall health? How well did that work for you? In most cases, probably not very well. That’s because these statements are too vague and do not give us any direction for what truly needs to be done to achieve such goals. To have a better chance at being successful, try using the SMART acronym for setting your goals (S= Specific, M= Measurable, A=Attainable, R= Realistic, T= Time-oriented):

Specific – Create a goal that has a focused and clear path for what you actually need to do.
Examples:

- I will drink 8 ounces of water 3 times per day
- I will walk briskly for 30 minutes, 5 times per week
- I will reduce my soda intake to no more than 2 cans of soda per week

Do you see how that is more helpful than just saying you will eat healthier or exercise more? It gives you direction.

Measurable – This enables you to track your progress, and ties in with the “specific” component. The above examples all have actual numbers associated with the behavior change that let you know whether or not it has been met.

Attainable – Make sure that your goal is within your capabilities and not too far out of reach. For example, if you have not been physically active for a number of years, it would be highly unlikely that you would be able to achieve a goal of running a marathon within the next month.

Realistic – Try to ensure that your goal is something you will be able to continue doing and incorporate as part of your regular routine/lifestyle. For example, if you made a goal to kayak 2 times each week, but don't have the financial resources to purchase or rent the equipment, no way to transport it, or are not close enough to a body of water in which to partake in kayaking, then this is not going to be feasible.

Time-oriented – Give yourself a target date or deadline in which the goal needs to be met. This will keep you on track and motivated to reach the goal, while also evaluating your progress.

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Transtheoretical Model

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CHAPTER 2: Psychological Health

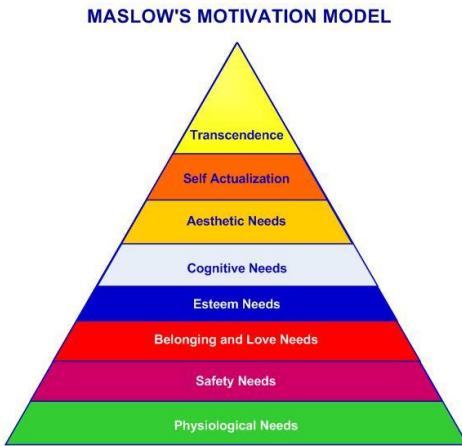


Figure 2. Maslow's Motivation Model

Maslow's hierarchy of needs is a theory in psychology proposed by Abraham Maslow in his 1943 paper "A Theory of Human Motivation" in Psychological Review. Maslow used the terms "physiological", "safety", "belonging" and "love", "esteem", "self-actualization", and "self-transcendence" to describe the pattern that human motivations generally move through. The goal of Maslow's Theory is to attain the sixth level of stage: self-transcendent needs.

Maslow's hierarchy of needs is often portrayed in the shape of a pyramid with the largest, most fundamental needs at the bottom and the need for self-actualization and self-transcendence at the top.

The most fundamental and basic four layers of the pyramid contain what Maslow called "deficiency needs" or "d-needs": esteem, friendship and love, security, and physical needs. If these "deficiency needs" are not met – with the exception of the most fundamental (physiological) need – there may not be a physical indication, but the individual will feel anxious and tense. Maslow's theory suggests that the most basic level of needs must be met before the individual will strongly desire (or focus motivation upon) the secondary or higher level needs.

The human brain is a complex system and has parallel processes running at the same time, thus many different motivations from various levels of Maslow's hierarchy can occur at the same time. Maslow spoke clearly about these levels and their satisfaction in terms such as "relative", "general", and "primarily". Instead of stating that the individual focuses on a certain need at any given time, Maslow stated that a certain need "dominates" the human organism. Thus Maslow acknowledged the likelihood that the different levels of motivation could occur at any time in the human mind, but he focused on identifying the basic types of motivation and the order in which they should be met.

Section 2.1 Physiological Needs

Physiological needs are the physical requirements for human survival. If these requirements are not met, the human body cannot function properly and will ultimately fail. Physiological needs are thought to be the most important; they should be met first. Air, water, and food are metabolic requirements for survival in all animals, including humans. Clothing and shelter provide necessary protection from the elements. While maintaining an adequate birth rate shapes the intensity of the human sexual instinct, sexual competition may also shape said instinct.

Section 2.2 Safety Needs

Once a person's physiological needs are relatively satisfied, his/her safety needs take precedence and dominate behavior. In the absence of physical safety – due to war, natural disaster, family violence, childhood abuse, etc. – people may (re-)experience post-traumatic stress disorder or transgenerational trauma. In the absence of economic safety – due to economic crisis and lack of work opportunities – these safety needs manifest themselves in ways such as a preference for job security, grievance procedures for protecting the individual from unilateral authority, savings accounts, insurance policies, disability accommodations, etc. This level is more likely to be found in children as they generally have a greater need to feel safe.

Safety and Security needs include:

- Personal security
- Financial security
- Health and well-being
- Safety net against accidents/illness and their adverse impacts

Section 2.3 Social Belonging

After physiological and safety needs are fulfilled, the third level of human needs is interpersonal and involves feelings of belongingness. This need is especially strong in childhood and it can override the need for safety as witnessed in children who cling to abusive parents. Deficiencies within this level of Maslow's hierarchy – due to hospitalism, neglect, shunning, ostracism, etc. – can adversely affect the individual's ability to form and maintain emotionally significant relationships in general, such as:

- Friendships
- Intimacy
- Family

According to Maslow, humans need to feel a sense of belonging and acceptance among their social groups, regardless whether these groups are large or small. For example, some large

social groups may include clubs, co-workers, religious groups, professional organizations, sports teams, and gangs. Some examples of small social connections include family members, intimate partners, mentors, colleagues, and confidants. Humans need to love and be loved – both sexually and non-sexually – by others. Many people become susceptible to loneliness, social anxiety, and clinical depression in the absence of this love or belonging element. This need for belonging may overcome the physiological and security needs, depending on the strength of the peer pressure.

Section 2.4 Esteem

All humans have a need to feel respected; this includes the need to have self-esteem and self-respect. Esteem presents the typical human desire to be accepted and valued by others. People often engage in a profession or hobby to gain recognition. These activities give the person a sense of contribution or value. Low self-esteem or an inferiority complex may result from imbalances during this level in the hierarchy. People with low self-esteem often need respect from others; they may feel the need to seek fame or glory. However, fame or glory will not help the person to build their self-esteem until they accept who they are internally. Psychological imbalances such as depression can hinder the person from obtaining a higher level of self-esteem or self-respect. Most people have a need for stable self-respect and self-esteem. Maslow noted two versions of esteem needs: a "lower" version and a "higher" version. The "lower" version of esteem is the need for respect from others. This may include a need for status, recognition, fame, prestige, and attention. The "higher" version manifests itself as the need for self-respect. For example, the person may have a need for strength, competence, mastery, self-confidence, independence, and freedom. This "higher" version takes precedence over the "lower" version because it relies on an inner competence established through experience. Deprivation of these needs may lead to an inferiority complex, weakness, and helplessness.

Maslow states that while he originally thought the needs of humans had strict guidelines, the "hierarchies are interrelated rather than sharply separated". This means that esteem and the subsequent levels are not strictly separated; instead, the levels are closely related.

Section 2.5 Self-Actualization

"What a man can be, he must be." [This quotation forms the basis of the perceived need for self-actualization. This level of need refers to what a person's full potential is and the realization of that potential. Maslow describes this level as the desire to accomplish everything that one can, to become the most that one can be. Individuals may perceive or focus on this need very specifically. For example, one individual may have the strong desire to become an ideal parent. In another, the desire may be expressed athletically. For others, it may be expressed in paintings, pictures, or inventions. As previously mentioned, Maslow believed that to understand this level of need, the person must not only achieve the previous needs, but master them.

Section 2.6 Self-Transcendence

In his later years, Abraham Maslow explored a further dimension of needs, while criticizing his own vision on self-actualization. The self only finds its actualization in giving itself to some higher goal outside oneself, in altruism and spirituality, which is essentially the desire to reach infinite. "Transcendence refers to the very highest and most inclusive or holistic levels of human consciousness, behaving and relating, as ends rather than means, to oneself, to significant others, to human beings in general, to other species, to nature, and to the cosmos" (Farther Reaches of Human Nature, New York 1971, p. 269).

Section 2.7 Mental Health

According to the World Health Organization (WHO), mental health includes "subjective wellbeing, perceived self-efficacy, autonomy, competence, inter-generational dependence, and self-actualization of one's intellectual and emotional potential, among others." The WHO further states that the well-being of an individual is encompassed in the realization of their abilities, coping with normal stresses of life, productive work and contribution to their community. Cultural differences, subjective assessments, and competing professional theories all affect how "mental health" is defined. A widely accepted definition of health by mental health specialists is psychoanalyst Sigmund Freud's definition: the capacity "to work and to love".

Mental Health Issues Are Prevalent Among College Students

Mental health issues are a leading impediment to academic success among college students. Untreated mental illness in the college student population — including depression, anxiety and eating disorders — is associated with lower GPA and higher probability of dropping out of school. Treatment is effective and available yet because of an unnecessary shame surrounding these issues, mental health is not discussed and too many students are suffering in silence

- An estimated 26 percent of Americans ages 18 and older – or about 1 in 4 adults - live with a diagnosable mental health disorder.
- Half of all serious adult psychiatric illnesses – including major depression, anxiety disorders, and substance abuse – start by 14 years of age. Three-fourths of them are present by 25 years of age.
- Compared to older adults, the 18-24 year old age group shows the lowest rate of help-seeking.

Mental Health Issues Impact Students' Ability To Succeed:

- Almost one third of all college students report having felt so depressed that they had trouble functioning.

- Mental health issues in the college student population, such as depression, anxiety, and eating disorders, are associated with lower GPA and higher probability of dropping out of college.
- More than 80 percent of college students felt overwhelmed by all they had to do in the past year and 45 percent have felt things were hopeless.

Mental health issues can be deadly:

- Suicide is the 2nd leading cause of death among college students, claiming the lives of 1,100 students each year.
- 67% of college students tell a friend they are feeling suicidal before telling anyone else.
- More than half of college students have had suicidal thoughts and 1 in 10 students seriously consider attempting suicide. Half of students who have suicidal thoughts never seek counseling or treatment.
- 80-90% of college students who die by suicide were not receiving help from their college counseling centers

Section 2.8 Emotional Health

Emotional well-being is a term that has been used increasingly in recent decades. The implications of decreased emotional well-being are related to mental health concerns such as stress, depression, and anxiety. These in turn can contribute to physical ill-health such as digestive disorders, sleep disturbances, and general lack of energy.^[1] The profile of a person prone to emotional distress is usually someone with low self-esteem, pessimistic, very self-critical, etc. and people who need to constantly assert themselves through their behavior. They also tend to be afraid, overly worried about the future, and focused on the past.

On the positive side, enhanced emotional well-being is seen to contribute to upward spirals in increasing coping ability, self-esteem, performance and productivity at work, and even longevity. Thoughts determine feelings, and thoughts are nothing more than firings of neurons. And those feelings that thoughts generate make the body release extremely addicting substances like adrenaline and cortisol. Like with any other addiction, the need to continually feed off these addicting substances tends to make the body think and feel in a certain way. When someone decides to disengage from these emotional addictions, he/she must learn to think differently.

Emotions and feelings are part of every step a person takes. A person must learn how to manage himself/herself in order to reach the maximum potential in all aspects of life. Good emotional health leads to better physical health, prevents diseases, and makes it possible to enjoy life and be happier. In this way you can become a “medicine person” through mirror neurons, those that lead to empathy and fire to imitate the emotions of others. Mirror neurons are what make you feel good when you’re with someone who is positive, cheerful

and motivational. At the other extreme are the so-called “toxic people”, who make others around them feel bad.

Section 2.9 Spiritual Health

The spiritual dimension is understood to imply a phenomenon that is not material in nature, but belongs to the realm of ideas, beliefs, values and ethics that have arisen in the minds and conscience of human beings, particularly ennobling ideas. Ennobling ideas have given rise to health ideals, which have led to a practical strategy for Health for All that aims at attaining a goal that has both a material and non-material component. If the material component of the strategy can be provided to people, the non-material or spiritual one is something that has to arise within people and communities in keeping with their social and cultural patterns. The spiritual dimension plays a great role in motivating people's achievement in all aspects of life.^[7]

Section 2.10 Social Health

The capacity for an individual to develop and flourish is deeply influenced by immediate social surroundings – including their opportunity to engage positively with family members, friends or colleagues, and earn a living for themselves and their families – and also by the socioeconomic circumstances in which said individual find himself/herself. Restricted or lost opportunities to gain an education and income are especially pertinent socio-economic factors.

Psychoneuroimmunology is defined as the examination of the interactions among psychological, behavioral, and social factors with immunological and neuroendocrine outcomes. It is now well established that psychological factors, especially chronic stress, can lead to impairments in immune system function in both the young and older adults. In several studies of older adults, those who are providing care for a relative with dementia report high levels of stress and exhibit significant impairments in immune system functioning when compared with non-caregivers. Stress-induced changes in the immune system may affect a number of outcomes, including slowing the wound healing process and increasing susceptibility to infections.

Section 2.11 Factors That Influence Psychological Well-Being

Infancy and Early Childhood

There is a strong body of evidence to show the importance of attachment by neonates to their mothers or other primary caregivers for subsequent social and emotional development. Separation from the primary caregiver - due for example to parental absence or rejection - leads to anxiety, stress and insecurity. Post-natal depression among new mothers can likewise contribute to sub-optimal attachment and development. Parents who have difficulties in bonding, have limited skills or exhibit negative attitudes place their children at increased risk of exposure to stress and behavioral problems. Other important

risks to physical and cognitive development in infancy and early childhood include maltreatment and neglect (by parents and other caregivers), malnutrition and infectious or parasitic diseases.

Individual attributes and behaviors

These relate to a person's innate and learned ability to deal with thoughts and feelings and to manage him/herself in daily life ('emotional intelligence'). It is also the capacity to deal with the social world around by partaking in social activities, taking responsibilities or respecting the views of others ('social intelligence'). An individual's mental health state can also be influenced by genetic and biological factors; that is, determinants that persons are born or endowed with, including chromosomal abnormalities (e.g. Down's syndrome) and intellectual disability caused by prenatal exposure to alcohol or oxygen deprivation at birth.

Social and economic circumstances

The capacity for people to develop and flourish is deeply influenced by their immediate social surroundings – including their opportunity to engage positively with family members, friends or colleagues, and earn a living for themselves and their families – and also by the socioeconomic circumstances in which they find themselves. Restricted or lost opportunities to gain an education and income are especially pertinent socio-economic factors.

Environmental factors

The wider sociocultural and geopolitical environment in which people live can also affect an individual's, household's or community's mental health status, including levels of access to basic commodities and services (water, essential health services, the rule of law), exposure to predominating cultural beliefs, attitudes or practices, as well as by social and economic policies formed at the national level; for example, the on-going global financial crisis is expected to have significant mental health consequences, including increased rates of suicide and harmful alcohol use. Discrimination, social or gender inequality and conflict are examples of adverse structural determinants of mental well-being.

Personality

Personality measures turn out to be good predictors of your health, your sexual promiscuity, your likelihood of divorce, how happy you typically are—even your taste in paintings. Personality is a much better predictor of these things than social class or age. The origin of these differences is in part innate. That is to say, when people are adopted at birth and brought up by new families, their personalities are more similar to their blood relatives than to the ones they grew up with. The differences begin to emerge early in life and are surprisingly stable across the decades. This is not to say that people cannot change, but major change is the exception rather than the rule. Personality differences tend to manifest themselves through the quick, gut-feeling, intuitive, and emotional systems of the

human mind. The slower, rational, deliberate systems show less variation in output from person to person. Deliberate rational strategies can be used to over-ride intuitive patterns of response, and this is how people wishing to change their personalities or feelings have to go about it.

So what are the major ways personalities can differ? The dominant approach is to think of the space of possible personalities as being defined by a number of dimensions. Each person can be given a location in the space by their scores on all the different dimensions. Virtually all theories agree on two of the main dimensions, though they differ on how many additional ones they recognize.

Five factors

- Openness to experience: (inventive/curious vs. consistent/cautious). Appreciation for art, emotion, adventure, unusual ideas, curiosity, and variety of experience. Openness reflects the degree of intellectual curiosity, creativity and a preference for novelty and variety a person has. It is also described as the extent to which a person is imaginative or independent and depicts a personal preference for a variety of activities over a strict routine. High openness can be perceived as unpredictability or lack of focus. Moreover, individuals with high openness are said to pursue self-actualization specifically by seeking out intense, euphoric experiences. Conversely, those with low openness seek to gain fulfillment through perseverance and are characterized as pragmatic and data-driven—sometimes even perceived to be dogmatic and closed-minded. Some disagreement remains about how to interpret and contextualize the openness factor.
- Conscientiousness: (efficient/organized vs. easy-going/careless). A tendency to be organized and dependable, show self-discipline, act dutifully, aim for achievement, and prefer planned rather than spontaneous behavior. High conscientiousness is often perceived as stubbornness and obsession. Low conscientiousness is associated with flexibility and spontaneity, but can also appear as sloppiness and lack of reliability.
- Extraversion: (outgoing/energetic vs. solitary/reserved). Energy, positive emotions, surgency, assertiveness, sociability and the tendency to seek stimulation in the company of others, and talkativeness. High extraversion is often perceived as attention-seeking, and domineering. Low extraversion causes a reserved, reflective personality, which can be perceived as aloof or self-absorbed.
- Agreeableness: (friendly/compassionate vs. challenging/detached). A tendency to be compassionate and cooperative rather than suspicious and antagonistic towards others. It is also a measure of one's trusting and helpful nature, and whether a person is generally well-tempered or not. High agreeableness is often seen as naive or submissive. Low agreeableness personalities are often competitive or challenging people, which can be seen as argumentativeness or untrustworthiness.

- Neuroticism: (sensitive/nervous vs. secure/confident). The tendency to experience unpleasant emotions easily, such as anger, anxiety, depression, and vulnerability. Neuroticism also refers to the degree of emotional stability and impulse control and is sometimes referred to by its low pole, "emotional stability". A high need for stability manifests itself as a stable and calm personality, but can be seen as uninspiring and unconcerned. A low need for stability causes a reactive and excitable personality, often very dynamic individuals, but they can be perceived as unstable or insecure.

Assess yourself! This is an interactive version of the **IPIP Big-Five Factor Markers**, a measure of the big five personality traits: [Big 5 Personality Test](#)

Section 2.12 Developing and protecting individual attributes

At its core, mental health and well-being rests on the capacity of individuals to manage their thoughts, feelings and behavior, as well as their interactions with others. It is essential that these core attributes of self-control, resilience and confidence be allowed to develop and solidify in the formative stages of life, so that individuals are equipped to deal with the complex choices and potential adversities they will face as they grow older.

Alcohol, tobacco and drug use pose risks to mental and physical health, particularly among pregnant women and adolescents. Raising awareness about the health risks of substance use can be accompanied by implementation of a number of proven strategies for reducing their use, including fiscal measures (namely, increased excise taxes) and regulatory instruments (such as comprehensive restrictions on advertising, minimum age of use and restrictions on smoking in public places).

Maintaining a healthy diet and regular physical exercise are also protective factors for mental health and can be considered as part of a holistic approach to health promotion and protection in the population.

Section 2.13 Supporting families and communities

Individual-level mental health and well-being is strongly mediated by the immediate social context in which people live, work and carry out their day-to-day activities. The focus of family- and community-level attention is therefore to foster living and working conditions that enable psychosocial development (particularly among vulnerable persons) and promote positive interactions within and between families and social groups. Certain mental health promotion and protection strategies are targeted at specific groups, including: home-based interventions for socioeconomically disadvantaged families and for children with a mentally ill parent; prevention of intimate partner violence; school-based interventions for children and adolescents exhibiting emotional or behavioral problems; work-based interventions for adults looking for employment or struggling to cope at work; community-based interventions aimed at enhanced social participation of older adults; and psychosocial support for persons affected by conflict or disaster.

Section 2.14 Supporting vulnerable groups in society

At the level of social and environmental determinants, key predictors of – and also consequences of – mental ill-health include lack of access to basic amenities and services, social exclusion, discrimination and exposure to violence, conflict or disasters. State-wide policy instruments that can address these failings and contribute towards social equality, inclusion and security include: anti-discrimination laws and campaigns; social protection for the poor; and elaboration of peaceful relations within and across national or ethnic boundaries.

Section 2.15 Mental Illness

We have all had some exposure to mental illness, but do we really understand it or know what it is? Many of our preconceptions are incorrect. A mental illness can be defined as a health condition that changes a person's thinking, feelings, or behavior (or all three) and that causes the person distress and difficulty in functioning. As with many diseases, mental illness is severe in some cases and mild in others. Individuals who have a mental illness don't necessarily look like they are sick, especially if their illness is mild. Other individuals may show more explicit symptoms such as confusion, agitation, or withdrawal.

Even if you or a family member has not experienced mental illness directly, it is very likely that you have known someone who has. Estimates are that at least one in four people is affected by mental illness either directly or indirectly.

Consider the following statistics to get an idea of just how widespread the effects of mental illness are in society:

- According to recent estimates, approximately 20 percent of Americans, or about one in five people over the age of 18, suffer from a diagnosable mental disorder in a given year.
- Four of the 10 leading causes of disability—major depression, bipolar disorder, schizophrenia, and obsessive-compulsive disorder—are mental illnesses.
- About 3 percent of the population have more than one mental illness at a time.
- About 5 percent of adults are affected so seriously by mental illness that it interferes with their ability to function in society. These severe and persistent mental illnesses include schizophrenia, bipolar disorder, other severe forms of depression, panic disorder, and obsessive-compulsive disorder.
- Approximately 20 percent of doctors' appointments are related to anxiety disorders such as panic attacks. Eight million people have depression each year.
- Two million Americans have schizophrenia disorders, and 300,000 new cases are diagnosed each year.

Section 2.16 Mood Disorders

Major mood disorders are depression, bipolar disorder, and dysthymic disorder. Like anxiety, depression might seem like something that everyone experiences at some point, and it is true that most people feel sad or “blue” at times in their lives. A true depressive episode, however, is more than just feeling sad for a short period. It is a long-term, debilitating illness that usually needs treatment to cure. And bipolar disorder is characterized by dramatic shifts in energy and mood, often affecting the individual’s ability to carry out day-to-day tasks. Bipolar disorder used to be called manic depression because of the way that people would swing between manic and depressive episodes.

Section 2.17 Depression

Depression, or depressive disorders, is a leading cause of disability in the United States as well as worldwide. It affects an estimated 9.5 percent of American adults in a given year. Nearly twice as many women as men have depression. Depression is more than just being in a bad mood or feeling sad. Everyone experiences these feelings on occasion, but that does not constitute depression. Depression is actually not a single disease; there are three main types of depressive disorders. They are major depressive disorder, dysthymia, and bipolar disorder (manic-depression).

While some of the symptoms of depression are common during a passing “blue mood,” major depressive disorder is diagnosed when a person has five or more of the symptoms nearly every day during a two-week period. Symptoms of depression include a sad mood, a loss of interest in activities that one used to enjoy, a change in appetite or weight, oversleeping or difficulty sleeping, physical slowing or agitation, energy loss, feelings of worthlessness or inappropriate guilt, difficulty concentrating, and recurrent thoughts of death or suicide.

When people have depression, their lives are affected severely: they have trouble performing at work or school, and they aren’t interested in normal family and social activities. In adults, an untreated major depressive episode lasts an average of nine months. At least half of the people who experience an episode of major depression will have another episode of depression at some point.

Section 2.18 Dysthymic Disorder

Dysthymia is less severe than major depressive disorder, but it is more chronic. In dysthymia, a depressed mood along with at least two other symptoms of depression persist for at least two years in adults, or one year in children or adolescents. These symptoms may not be as disabling, but they do keep affected people from functioning well or feeling good. Dysthymia often begins in childhood, adolescence, or early adulthood. On average, untreated dysthymia lasts four years in children and adolescents.

Section 2.19 Bipolar Disorder

A third type of depressive disorder is bipolar disorder, also called manic-depression. A person who has bipolar disorder alternates between episodes of major depression and mania (periods of abnormally and persistently elevated mood or irritability). During manic periods, the person will also have three or more of the following symptoms: overly inflated self-esteem, decreased need for sleep, increased talkativeness, racing thoughts, distractibility, increased goal-directed activity or physical agitation, and excessive involvement in pleasurable activities that have a high potential for painful consequences. While in a manic phase, adolescents may engage in risky or reckless behaviors such as fast driving and unsafe sex. Bipolar disorder frequently begins during adolescence or young adulthood. Adults with bipolar disorder often have clearly defined episodes of mania and depression, with periods of mania every two to four years.

Section 2.20 The Causes of Depression (depressive disorders)

Depression, like other mental illnesses, is probably caused by a combination of biological, environmental, and social factors, but the exact causes are not yet known. For years, scientists thought that low levels of certain neurotransmitters (such as serotonin, dopamine, or norepinephrine) in the brain caused depression. However, scientists now believe that the interplay of factors leading to depression is much more complex. Genetic causes have been suggested from family studies that have shown that between 20 and 50 percent of children and adolescents with depression have a family history of depression and that children of depressed parents are more than three times as likely as children with nondepressed parents to experience a depressive disorder. Abnormal endocrine function, specifically of the hypothalamus or pituitary, may play a role in causing depression. Other risk factors for depressive disorders in youths include stress, cigarette smoking, loss of a parent, the breakup of a romantic relationship, attention disorders, learning disorders, abuse, neglect, and other trauma including experiencing a natural disaster.

Section 2.21 Treating depression

A variety of antidepressant medications and psychotherapies are used to treat depression. The most effective treatment for most people is a combination of medication and psychotherapy. Many of us are aware that medications are available to treat depressive disorders—we see the ads on television and in magazines. Up to 70 percent of people with depression can be treated effectively with medication.

Medications used to treat depressive disorders usually act on the neurotransmission pathway. For example, some medications affect the activity of certain neurotransmitters, such as serotonin or norepinephrine. Different depressive disorders require different medication therapies. For example, individuals who have bipolar disorder are often treated with a mood-stabilizing drug, such as lithium, during their manic phase and a combination of mood-stabilizer and antidepressant medications during their depressive phase.

Medications usually lead to relief from the symptoms of depression within six to eight weeks. If one drug doesn't relieve symptoms, doctors can prescribe a different antidepressant drug. As with drugs to treat other mental illnesses, patients are monitored closely by their doctor for symptoms of depression and for side effects. Patients who continue to take their medication for at least six months after recovery from major depression are 70 percent less likely to experience a relapse. Psychotherapy helps patients learn more effective ways to deal with the problems in their lives. These therapies usually involve 6 to 20 weekly meetings. These treatment plans should be revised if there is no improvement of symptoms within three or four months.

Section 2.22 Coping with Depression

People who have depression (or another depressive disorder) feel exhausted, worthless, helpless, and hopeless. These negative thoughts and feelings that are part of depression make some people feel like giving up. As treatment takes effect, these thoughts begin to go away.

Some strategies that can help a person waiting for treatment to take effect include setting realistic goals in light of the depression and assuming a reasonable amount of responsibility; breaking large tasks into small ones, setting some priorities, and doing what one can as one can; trying to be with other people and to confide in someone—it is usually better than being alone and secretive; participating in activities that may make one feel better; getting some mild exercise, going to a movie or a ball game, or participating in religious, social, or other activities; expecting one's mood to improve gradually, not immediately (feeling better takes time); postponing important decisions until the depression has lifted and discussing big decisions with family or friends who have a more objective view of the situation; remembering that positive thinking will replace the negative thinking that is part of the depression as one's depression responds to treatment; and letting one's family and friends help.

Section 2.23 Anxiety Disorders

Anxiety Disorders affect about 40 million American adults age 18 years and older (about 18%) in a given year, causing them to be filled with fearfulness and uncertainty. Unlike the relatively mild, brief anxiety caused by a stressful event (such as speaking in public or a first date), anxiety disorders last at least 6 months and can get worse if they are not treated. Anxiety disorders commonly occur along with other mental or physical illnesses, including alcohol or substance abuse, which may mask anxiety symptoms or make them worse. In some cases, these other illnesses need to be treated before a person will respond to treatment for the anxiety disorder.

Panic Disorders

"For me, a panic attack is almost a violent experience. I feel disconnected from reality. I feel like I'm losing control in a very extreme way. My heart pounds really hard, I feel

like I can't get my breath, and there's an overwhelming feeling that things are crashing in on me."

"It started 10 years ago, when I had just graduated from college and started a new job. I was sitting in a business seminar in a hotel and this thing came out of the blue. I felt like I was dying."

"In between attacks there is this dread and anxiety that it's going to happen again. I'm afraid to go back to places where I've had an attack. Unless I get help, there soon won't be anyplace where I can go and feel safe from panic."

Panic disorder is a real illness that can be successfully treated. It is characterized by sudden attacks of terror, usually accompanied by a pounding heart, sweatiness, weakness, faintness, or dizziness. During these attacks, people with panic disorder may flush or feel chilled; their hands may tingle or feel numb; and they may experience nausea, chest pain, or smothering sensations. Panic attacks usually produce a sense of unreality, a fear of impending doom, or a fear of losing control.

A fear of one's own unexplained physical symptoms is also a symptom of panic disorder. People having panic attacks sometimes believe they are having heart attacks, losing their minds, or on the verge of death. They can't predict when or where an attack will occur, and between episodes many worry intensely and dread the next attack.

Panic attacks can occur at any time, even during sleep. An attack usually peaks within 10 minutes, but some symptoms may last much longer. Panic disorder affects about 6 million American adults and is twice as common in women as men. Panic attacks often begin in late adolescence or early adulthood, but not everyone who experiences panic attacks will develop panic disorder. Many people have just one attack and never have another. The tendency to develop panic attacks appears to be inherited.

Obsessive-Compulsive Disorder

"I couldn't do anything without rituals. They invaded every aspect of my life. Counting really bogged me down. I would wash my hair three times as opposed to once because three was a good luck number and one wasn't. It took me longer to read because I'd count the lines in a paragraph. When I set my alarm at night, I had to set it to a number that wouldn't add up to a 'bad' number."

"I knew the rituals didn't make sense, and I was deeply ashamed of them, but I couldn't seem to overcome them until I had therapy."

"Getting dressed in the morning was tough, because I had a routine, and if I didn't follow the routine, I'd get anxious and would have to get dressed again. I always worried that if I didn't do something, my parents were going to die. I'd have these terrible thoughts of harming my parents. That was completely irrational, but the

thoughts triggered more anxiety and more senseless behavior. Because of the time I spent on rituals, I was unable to do a lot of things that were important to me."

People with obsessive-compulsive disorder (OCD) have persistent, upsetting thoughts (obsessions) and use rituals (compulsions) to control the anxiety these thoughts produce. Most of the time, the rituals end up controlling them.

For example, if people are obsessed with germs or dirt, they may develop a compulsion to wash their hands over and over again. If they develop an obsession with intruders, they may lock and relock their doors many times before going to bed. Being afraid of social embarrassment may prompt people with OCD to comb their hair compulsively in front of a mirror-sometimes they get "caught" in the mirror and can't move away from it. Performing such rituals is not pleasurable. At best, it produces temporary relief from the anxiety created by obsessive thoughts.

Healthy people also have rituals, such as checking to see if the stove is off several times before leaving the house. The difference is that people with OCD perform their rituals even though doing so interferes with daily life and they find the repetition distressing. Although most adults with OCD recognize that what they are doing is senseless, some adults and most children may not realize that their behavior is out of the ordinary.

OCD affects about 2.2 million American adults, and the problem can be accompanied by eating disorders, other anxiety disorders, or depression. It strikes men and women in roughly equal numbers and usually appears in childhood, adolescence, or early adulthood. One-third of adults with OCD develop symptoms as children, and research indicates that OCD might run in families.

Post-Traumatic Stress Disorder

"I was raped when I was 25 years old. For a long time, I spoke about the rape as though it was something that happened to someone else. I was very aware that it had happened to me, but there was just no feeling."

"Then I started having flashbacks. They kind of came over me like a splash of water. I would be terrified. Suddenly I was reliving the rape. Every instant was startling. I wasn't aware of anything around me, I was in a bubble, just kind of floating. And it was scary. Having a flashback can wring you out."

"The rape happened the week before Thanksgiving, and I can't believe the anxiety and fear I feel every year around the anniversary date. It's as though I've seen a werewolf. I can't relax, can't sleep, don't want to be with anyone. I wonder whether I'll ever be free of this terrible problem."

Post-traumatic stress disorder (PTSD) develops after a terrifying ordeal that involved physical harm or the threat of physical harm. The person who develops PTSD may have

been the one who was harmed, the harm may have happened to a loved one, or the person may have witnessed a harmful event that happened to loved ones or strangers.

PTSD was first brought to public attention in relation to war veterans, but it can result from a variety of traumatic incidents, such as mugging, rape, torture, being kidnapped or held captive, child abuse, car accidents, train wrecks, plane crashes, bombings, or natural disasters such as floods or earthquakes.

People with PTSD may startle easily, become emotionally numb (especially in relation to people with whom they used to be close), lose interest in things they used to enjoy, have trouble feeling affectionate, be irritable, become more aggressive, or even become violent. They avoid situations that remind them of the original incident, and anniversaries of the incident are often very difficult. PTSD symptoms seem to be worse if the event that triggered them was deliberately initiated by another person, as in a mugging or a kidnapping.

Most people with PTSD repeatedly relive the trauma in their thoughts during the day and in nightmares when they sleep. These are called flashbacks. Flashbacks may consist of images, sounds, smells, or feelings, and are often triggered by ordinary occurrences, such as a door slamming or a car backfiring on the street. A person having a flashback may lose touch with reality and believe that the traumatic incident is happening all over again.

Not every traumatized person develops full-blown or even minor PTSD. Symptoms usually begin within 3 months of the incident but occasionally emerge years afterward. They must last more than a month to be considered PTSD. The course of the illness varies. Some people recover within 6 months, while others have symptoms that last much longer. In some people, the condition becomes chronic.

PTSD affects about 7.7 million American adults, but it can occur at any age, including childhood. Women are more likely to develop PTSD than men, and there is some evidence that susceptibility to the disorder may run in families. PTSD is often accompanied by depression, substance abuse, or one or more of the other anxiety disorders.

Social Phobia (Social Anxiety Disorder)

"In any social situation, I felt fear. I would be anxious before I even left the house, and it would escalate as I got closer to a college class, a party, or whatever. I would feel sick in my stomach-it almost felt like I had the flu. My heart would pound, my palms would get sweaty, and I would get this feeling of being removed from myself and from everybody else."

"When I would walk into a room full of people, I'd turn red and it would feel like everybody's eyes were on me. I was embarrassed to stand off in a corner by myself, but I couldn't think of anything to say to anybody. It was humiliating. I felt so clumsy, I couldn't wait to get out."

Social phobia, also called social anxiety disorder, is diagnosed when people become overwhelmingly anxious and excessively self-conscious in everyday social situations. People with social phobia have an intense, persistent, and chronic fear of being watched and judged by others and of doing things that will embarrass them. They can worry for days or weeks before a dreaded situation. This fear may become so severe that it interferes with work, school, and other ordinary activities, and can make it hard to make and keep friends.

While many people with social phobia realize that their fears about being with people are excessive or unreasonable, they are unable to overcome them. Even if they manage to confront their fears and be around others, they are usually very anxious beforehand, are intensely uncomfortable throughout the encounter, and worry about how they were judged for hours afterward.

Social phobia can be limited to one situation (such as talking to people, eating or drinking, or writing on a blackboard in front of others) or may be so broad (such as in generalized social phobia) that the person experiences anxiety around almost anyone other than the family.

Physical symptoms that often accompany social phobia include blushing, profuse sweating, trembling, nausea, and difficulty talking. When these symptoms occur, people with social phobia feel as though all eyes are focused on them.

Social phobia affects about 15 million American adults. Women and men are equally likely to develop the disorder, which usually begins in childhood or early adolescence.² There is some evidence that genetic factors are involved. Social phobia is often accompanied by other anxiety disorders or depression, and substance abuse may develop if people try to self-medicate their anxiety.

A specific phobia is an intense, irrational fear of something that poses little or no actual danger. Some of the more common specific phobias are centered around closed-in places, heights, escalators, tunnels, highway driving, water, flying, dogs, and injuries involving blood. Such phobias aren't just extreme fear; they are irrational fear of a particular thing. You may be able to ski the world's tallest mountains with ease but be unable to go above the 5th floor of an office building. While adults with phobias realize that these fears are irrational, they often find that facing, or even thinking about facing, the feared object or situation brings on a panic attack or severe anxiety.

Specific phobias affect an estimated 19.2 million adult Americans and are twice as common in women as men. They usually appear in childhood or adolescence and tend to persist into adulthood. The causes of specific phobias are not well understood, but there is some evidence that the tendency to develop them may run in families.

Generalized Anxiety Disorder (GAD)

"I always thought I was just a worrier. I'd feel keyed up and unable to relax. At times it would come and go, and at times it would be constant. It could go on for days. I'd worry about what I was going to fix for a dinner party, or what would be a great present for somebody. I just couldn't let something go."

"When my problems were at their worst, I'd miss work and feel just terrible about it. Then I worried that I'd lose my job. My life was miserable until I got treatment.

"I'd have terrible sleeping problems. There were times I'd wake up wired in the middle of the night. I had trouble concentrating, even reading the newspaper or a novel. Sometimes I'd feel a little lightheaded. My heart would race or pound. And that would make me worry more. I was always imagining things were worse than they really were. When I got a stomachache, I'd think it was an ulcer."

People with generalized anxiety disorder (GAD) go through the day filled with exaggerated worry and tension, even though there is little or nothing to provoke it. They anticipate disaster and are overly concerned about health issues, money, family problems, or difficulties at work. Sometimes just the thought of getting through the day produces anxiety.

GAD is diagnosed when a person worries excessively about a variety of everyday problems for at least 6 months. People with GAD can't seem to get rid of their concerns, even though they usually realize that their anxiety is more intense than the situation warrants. They can't relax, startle easily, and have difficulty concentrating. Often they have trouble falling asleep or staying asleep. Physical symptoms that often accompany the anxiety include fatigue, headaches, muscle tension, muscle aches, difficulty swallowing, trembling, twitching, irritability, sweating, nausea, lightheadedness, having to go to the bathroom frequently, feeling out of breath, and hot flashes.

When their anxiety level is mild, people with GAD can function socially and hold down a job. Although they don't avoid certain situations as a result of their disorder, people with GAD can have difficulty carrying out the simplest daily activities if their anxiety is severe. GAD affects about 6.8 million American adults, including twice as many women as men. The disorder develops gradually and can begin at any point in the life cycle, although the years of highest risk are between childhood and middle age. There is evidence that genes play a modest role in GAD.

Other anxiety disorders, depression, or substance abuse often accompany GAD, which rarely occurs alone. GAD is commonly treated with medication or cognitive-behavioral therapy, but co-occurring conditions must also be treated using the appropriate therapies.

Treatment of Anxiety Disorders

In general, anxiety disorders are treated with medication, specific types of psychotherapy, or both. Treatment choices depend on the problem and the person's preference. Before treatment begins, a doctor must conduct a careful diagnostic evaluation to determine whether a person's symptoms are caused by an anxiety disorder or a physical problem. If an anxiety disorder is diagnosed, the type of disorder or the combination of disorders that are present must be identified, as well as any coexisting conditions, such as depression or substance abuse. Sometimes alcoholism, depression, or other coexisting conditions have such a strong effect on the individual that treating the anxiety disorder must wait until the coexisting conditions are brought under control.

People with anxiety disorders who have already received treatment should tell their current doctor about that treatment in detail. If they received medication, they should tell their doctor what medication was used, what the dosage was at the beginning of treatment, whether the dosage was increased or decreased while they were under treatment, what side effects occurred, and whether the treatment helped them become less anxious. If they received psychotherapy, they should describe the type of therapy, how often they attended sessions, and whether the therapy was useful.

Often people believe that they have "failed" at treatment or that the treatment didn't work for them when, in fact, it was not given for an adequate length of time or was administered incorrectly. Sometimes people must try several different treatments or combinations of treatment before they find the one that works for them.

Personality Disorders

Personality disorders are long-term patterns of thoughts and behaviors that cause serious problems with relationships and work. People with personality disorders have difficulty dealing with everyday stresses and problems. They often have stormy relationships with other people. The exact cause of personality disorders is unknown. However, genes and childhood experiences may play a role. Symptoms vary widely depending on the specific type of personality disorder. Treatment usually includes talk therapy and sometimes medicine.

Borderline Personality Disorder

Borderline personality disorder is a serious mental illness marked by unstable moods, behavior, and relationships. In 1980, the Diagnostic and Statistical Manual for Mental Disorders, Third Edition (DSM-III) listed borderline personality disorder as a diagnosable illness for the first time. Most psychiatrists and other mental health professionals use the DSM to diagnose mental illnesses. Because some people with severe borderline personality disorder have brief psychotic episodes, experts originally thought of this illness as atypical, or borderline, versions of other mental disorders. While mental health experts now generally agree that the name "borderline personality disorder" is misleading, a more

accurate term does not exist yet. Most people who have borderline personality disorder suffer from:

- Problems with regulating emotions and thoughts
- Impulsive and reckless behavior
- Unstable relationships with other people

People with this disorder also have high rates of co-occurring disorders, such as depression, anxiety disorders, substance abuse, and eating disorders, along with self-harm, suicidal behaviors, and completed suicides. According to data from a subsample of participants in a national survey on mental disorders, about 1.6 percent of adults in the United States have borderline personality disorder in a given year. Borderline personality disorder is often viewed as difficult to treat. However, recent research shows that borderline personality disorder can be treated effectively, and that many people with this illness improve over time.

According to the DSM, Fourth Edition, Text Revision (DSM-IV-TR), to be diagnosed with borderline personality disorder, a person must show an enduring pattern of behavior that includes at least five of the following symptoms:

- Extreme reactions—including panic, depression, rage, or frantic actions—to abandonment, whether real or perceived
- A pattern of intense and stormy relationships with family, friends, and loved ones, often veering from extreme closeness and love (idealization) to extreme dislike or anger (devaluation)
- Distorted and unstable self-image or sense of self, which can result in sudden changes in feelings, opinions, values, or plans and goals for the future (such as school or career choices)
- Impulsive and often dangerous behaviors, such as spending sprees, unsafe sex, substance abuse, reckless driving, and binge eating.
- Recurring suicidal behaviors or threats or self-harming behavior, such as cutting Intense and highly changeable moods, with each episode lasting from a few hours to a few days
- Chronic feelings of emptiness and/or boredom Inappropriate, intense anger or problems controlling anger
- Having stress-related paranoid thoughts or severe dissociative symptoms, such as feeling cut off from oneself, observing oneself from outside the body, or losing touch with reality.

Seemingly mundane events may trigger symptoms. For example, people with borderline personality disorder may feel angry and distressed over minor separations — such as vacations, business trips, or sudden changes of plans —from people to whom they feel close. Studies show that people with this disorder may see anger in an emotionally neutral

face and have a stronger reaction to words with negative meanings than people who do not have the disorder.

Schizophrenia

Schizophrenia affects approximately 1 percent of the population, or 2.2 million U.S. adults. Men and women are equally affected. The illness usually emerges in young people in their teens or twenties. Although children over the age of five can develop schizophrenia, it is rare before adolescence. In children, the disease usually develops gradually and is often preceded by developmental delays in motor or speech development. Childhood-onset schizophrenia tends to be harder to treat and has a less favorable prognosis than does the adult-onset form.

The symptoms of schizophrenia:

There are many myths and misconceptions about schizophrenia. Schizophrenia is not a multiple or split personality, nor are individuals who have this illness constantly incoherent or psychotic. Although the media often portray individuals with schizophrenia as violent, in reality, very few affected people are dangerous to others. In fact, individuals with schizophrenia are more likely to be victims of violence than violent themselves. Schizophrenia has severe symptoms. A diagnosis of schizophrenia requires that at least two of the symptoms below be present during a significant portion of a one-month period: delusions (false beliefs such as conspiracies, mind control, or persecution); hallucinations (usually voices criticizing or commenting on the person's behavior); disorganized speech (incomprehensible or difficult to understand); grossly disorganized or catatonic behavior; and negative symptoms such as flat emotions, lack of facial expressions, and inattention to basic self-care needs such as bathing and eating.

However, the presence of either one of the first two symptoms is sufficient to diagnose schizophrenia if the delusions are especially bizarre or if the hallucinations consist of one or more voices that keep a running commentary on the person's behavior or thoughts. The DSM-IV specifies additional criteria for a diagnosis of schizophrenia: occupational dysfunction, persistence of the disturbance for at least six months, exclusion of a mood disorder, exclusion of a substance-abuse or medical condition that causes similar symptoms, and consideration of a possible pervasive developmental disorder. The course of schizophrenia varies considerably from one individual to the next. Most people who have schizophrenia experience at least one, and usually more, relapses after their first psychotic episode. Relapses are periods of more intense symptoms of illness (hallucinations and delusions). During remissions, the negative symptoms related to emotion or personal care are usually still present. About 10 percent of patients remain severely ill for long periods of time and do not return to their previous state of mental functioning. Several long-term studies found that as many as one-third to one-half of people with schizophrenia improve significantly or even recover completely from their illness.

The Causes of Schizophrenia

Like the other mental illnesses discussed here, scientists are still working to determine what causes schizophrenia. Also like the other mental illnesses, genetic and environmental factors most likely interact to cause the disease. Several studies suggest that an imbalance of chemical neurotransmitter systems of the brain, including the dopamine, GABA, glutamate, and norepinephrine neurotransmitter systems, are involved in the development of schizophrenia. Family, twin, and adoption studies support the idea that genetics plays an important role in the illness. For example, children of people with schizophrenia are 13 times more likely, and identical twins are 48 times more likely, to develop the illness than are people in the general population. Scientists continue to look at genes that may play a role in causing schizophrenia. One gene of interest to scientists who study schizophrenia codes for an enzyme that breaks down dopamine in the synapse.

Treating Schizophrenia

There is no cure for schizophrenia; however, effective treatments that make the illness manageable for most affected people are available. The optimal treatment includes antipsychotic medication combined with a variety of psychotherapeutic interventions. Since the 1950s, doctors have used antipsychotic drugs, such as chlorpromazine and haloperidol, to relieve the hallucinations and delusions typical of schizophrenia. Recently, newer (also called atypical) antipsychotic drugs such as risperidone and clozapine have proven to be more effective. Early and sustained treatment that includes antipsychotic medication is important for long-term improvement of the course of the disease. Patients who discontinue medication are likely to experience a relapse of their illness. People who manage schizophrenia best combine medication with psychosocial rehabilitation (life-skills training). Therapies that combine family and community support, education, and behavioral and cognitive skills to address specific challenges help schizophrenic patients improve their functioning and the quality of their lives.

Suicide and Self-harm

Suicide is among the most common causes of death in the United States. People may consider suicide when they are hopeless and can't see any other solution to their problems. Often it's related to serious [depression](#), [alcohol](#) or [substance abuse](#), or a major stressful event.

People who have the highest risk of suicide are white men. But women and teens report more suicide attempts. If someone talks about suicide, you should take it seriously. Urge them to get help from their doctor or the emergency room, or call the **National Suicide Prevention Lifeline at 1-800-273-TALK (8255)**.

Therapy and medicines can help most people who have suicidal thoughts. Treating mental illnesses and substance abuse can reduce the risk of suicide.

Suicidal behavior is complex. Some risk factors vary with age, gender, or ethnic group and may occur in combination or change over time. Suicide is a major, preventable public health problem. In 2007, it was the tenth leading cause of death in the U.S., accounting for 34,598 deaths. The overall rate was 11.3 suicide deaths per 100,000 people. An estimated 11 attempted suicides occur per every suicide death.

In 2007, suicide was the third leading cause of death for young people ages 15 to 24. As in the general population, young people were much more likely to use firearms, suffocation, and poisoning than other methods of suicide, overall. However, while adolescents and young adults were more likely to use firearms than suffocation, children were dramatically more likely to use suffocation.

There were also gender differences in suicide among young people, as follows:

- Nearly five times as many males as females ages 15 to 19 died by suicide.
- Just under six times as many males as females ages 20 to 24 died by suicide.

Research shows that risk factors for suicide include:

- depression and other mental disorders, or a substance-abuse disorder (often in combination with other mental disorders). More than 90 percent of people who die by suicide have these risk factors.
- prior suicide attempt
- family history of mental disorder or substance abuse
- family history of suicide
- family violence, including physical or sexual abuse
- firearms in the home, the method used in more than half of suicides
- incarceration
- exposure to the suicidal behavior of others, such as family members, peers, or media figures.

However, suicide and suicidal behavior are not normal responses to stress; many people have these risk factors, but are not suicidal. Research also shows that the risk for suicide is associated with changes in brain chemicals called neurotransmitters, including serotonin. Decreased levels of serotonin have been found in people with depression, impulsive disorders, and a history of suicide attempts, and in the brains of suicide victims. Public health approaches to preventing suicide include establishing telephone crisis hot lines, restricting access to suicide methods (for example, firearms), counseling media to reduce “copycat” suicides, screening teens for risk factors of suicide, and training professionals to improve recognition and treatment of mood disorders. Research about the effectiveness of these methods indicates that the screening and training strategies are more helpful for preventing suicides among young people than the other methods are.

Section 2.24 The Stigma of Mental Illness

Words can hurt. Many derogatory words and phrases are used in relation to mental illness. However, these words maintain the stereotyped image and not the reality about mental illness. Try not to use these words, and encourage students not to use them. It is more appropriate to refer to “a person who has a mental illness” when speaking about someone. “Mentally ill people are nuts, crazy, wacko.” “Mentally ill people are morally bad.” “Mentally ill people are dangerous and should be locked in an asylum forever.” “Mentally ill people need somebody to take care of them.” How often have we heard comments like these or seen these types of portrayals in movies, television shows, or books? We may even be guilty of making comments like them ourselves. Is there any truth behind these portrayals, or is that negative view based on our ignorance and fear?

Stigmas are negative stereotypes about groups of people. Common stigmas about people who are mentally ill are

- Individuals who have a mental illness are dangerous.
- Individuals who have a mental illness are irresponsible and can't make life decisions for themselves.
- People who have a mental illness are childlike and must be taken care of by parents or guardians.
- People who have a mental illness should just get over it.

Each of those preconceptions about people who have a mental illness is based on false information. Very few people who have a mental illness are dangerous to society. Most can hold jobs, attend school, and live independently. A person who has a mental illness cannot simply decide to get over it any more than someone who has a different chronic disease such as diabetes, asthma, or heart disease can. A mental illness, like those other diseases, is caused by a physical problem in the body.

Stigmas against individuals who have a mental illness lead to injustices, including discriminatory decisions regarding housing, employment, and education. Overcoming the stigmas commonly associated with mental illness is yet one more challenge that people who have a mental illness must face. Indeed, many people who successfully manage their mental illness report that the stigma they face is in many ways more disabling than the illness itself. The stigmatizing attitudes toward mental illness held by both the public and those who have a mental illness lead to feelings of shame and guilt, loss of self-esteem, social dependence, and a sense of isolation and hopelessness. One of the worst consequences of stigma is that people who are struggling with a mental illness may be reluctant to seek treatment that, in most cases, would significantly relieve their symptoms.

Providing accurate information is one way to reduce stigmas about mental illness. Advocacy groups protest stereotypes imposed upon those who are mentally ill. They demand that the media stop presenting inaccurate views of mental illness and that the public stops believing these negative views. A powerful way of countering stereotypes

about mental illness occurs when members of the public meet people who are effectively managing a serious mental illness: holding jobs, providing for themselves, and living as good neighbors in a community. Interaction with people who have mental illnesses challenges a person's assumptions and changes a person's attitudes about mental illness.

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CHAPTER 3: Stress Management

Stress is a feeling you get when faced with a challenge. In small doses, stress can be good for you because it makes you more alert and gives you a burst of energy. For instance, if you start to cross the street and see a car about to run you over, that jolt you feel helps you to jump out of the way before you get hit. But feeling stressed for a long time can take a toll on your mental and physical health. Even though it may seem hard to find ways to de-stress with all the things you have to do, it's important to find those ways. Your health depends on it.

Section 3.1 Chronic Stress

We all have stress sometimes. For some people, it happens before having to speak in public. For other people, it might be before a first date. What causes stress for you may not be stressful for someone else. Sometimes stress is helpful - it can encourage you to meet a deadline or get things done. But long-term stress can increase the risk of diseases like depression, heart disease and a variety of other problems. A stress-related illness called post-traumatic stress disorder (PTSD) develops after an event like war, physical or sexual assault, or a natural disaster.

If you have chronic stress, the best way to deal with it is to take care of the underlying problem. Counseling can help you find ways to relax and calm down. Medicines may also help.

Section 3.2 The Effects of Stress on the Body

Not all stress is bad. All animals have a stress response, which can be lifesaving in some situations. The nerve chemicals and hormones released during such stressful times prepares the animal to face a threat or flee to safety. When you face a dangerous situation, your pulse quickens, you breathe faster, your muscles tense, your brain uses more oxygen and increases activity—all functions aimed at survival. In the short term, it can even boost the immune system.

However, with chronic stress, those same nerve chemicals that are life-saving in short bursts can suppress functions that aren't needed for immediate survival. Your immunity is lowered and your digestive, excretory, and reproductive systems stop working normally. Once the threat has passed, other body systems act to restore normal functioning. Problems occur if the stress response goes on too long, such as when the source of stress is constant, or if the response continues after the danger has subsided.

Section 3.3 Stress and the Brain

Stress has many definitions, but according to Richard Lazarus, stress is a state of anxiety produced when events and responsibilities exceed one's coping abilities. In this way, stress relies not only on environmental factors, but on cognitive appraisals of these factors

(Myers, 2004). The cerebral cortex perceives the stressor, the hypothalamus stimulates the pituitary gland to release epinephrine and norepinephrine. This in turn stimulates the adrenal glands to release the hormone cortisol (Myers, 2004). Stress affects many other areas of the body, such as the amygdala, which produces a fear response. It seems to hardwire the brain differently. Middle-aged rats that had undergone early life stress had abnormal brain-cell activity and memory loss (Brunson et. al., 2005).

The sources of stress are numerous: from catastrophes such as Hurricane Katrina, significant life changes, poverty and inequality, to daily hassles like traffic tie-ups and demanding jobs (Myer, 2004). Especially in urban and overcrowded environments, psychologist s see links between everyday stressors and hypertension, and unhealthy behaviors such as lack of sleep and alcoholism (Lazarus & Folkman, 1984). In fact, the leading causes of death today in America are linked to lifestyle and stress. According United Nations Security Council, about half of the world's children grow up in extremely stressful environments (poverty, violence, war, abuse), which means that these children may have impaired cognitive abilities later on in life.

According to research by Janet Rodin, the less perceived control of a situation, the greater the stress. The elderly that lived in nursing homes, were lonely, and had to be fed, dressed, and changed, felt significantly more stress and had shorter lifespans than their independent, active counterparts.

Females seem to be more susceptible to stress and depression. After experiencing traumatic events, females are twice as likely as men to develop Post Traumatic Stress Disorder, where humans develop maladaptive behaviors such as avoidance, reduced responsiveness and guilt (Myers, 2004).

However, mindful exercise, such as Tai Chi, meditation, and aerobic exercise decrease stress response and promote overall well-being (Sandlund and Norlander, 2000). In a University of Wisconsin study, participants who did meditative exercises showed more electrical activity in the left side of the frontal lobe, indicating that they had a lower anxiety and a more positive emotional state (Davidson, 2003). Meditation, yoga, and other relaxation exercises also assist in autonomic reflexes. This is called conscious control. Through these practices, it is possible to gain control over the sphincter muscles in the anus and bladder. Yoga has been shown to help control heart rate, blood pressure, and other autonomic functions. These are learned behaviors - they involve the formation of new pathways in the brain.

Researchers have also found the correlation between a social support network of close friends and family and less physiological stress effects (Brown and Harris, 1978). Stress Inoculation Training and Hardiness Training are cognitive behavioral techniques that work to improve stress resistance through analyzing stressors, teaching coping techniques, and changing behavior so that the patient feels more assertive and in control (Kobasa, 1986). Drugs, such as beta-blockers, which reduce stress arousal, anxiolytic drugs, such as minor tranquilizers, and anti-depressant drugs, which treat severe anxiety, can also be used to combat stress.

Section 3.4 Your Bodies Response to Stress

Fight or Flight Response

When we experience excessive stress, either from internal worry or external circumstance, a bodily reaction called the "fight-or-flight" response will be triggered. Harvard physiologist Walter Cannon originally defined it. The response system represents the genetic impulse to protect ourselves from bodily harm, but also can result in negative health effects. According to Cannon's theory, during stress-response processes, the sympathetic nervous system increases the heart rate and releases chemicals to prepare our body to either fight or flee. When the fight-or-flight response system gets activated, it tends to perceive everything in the environment as a potential threat to survival.

In modern life, we do not get the option of "flight" very often. We have to deal with those stressors all the time and find a solution. When you need to take an SAT test, there is no way for you to avoid it; sitting in the test room for five hours is the only choice. Lacking the "flight" option in stress-response process leads to higher stress levels in modern society.

Section 3.5 General Adaptation Syndrome

Selye's Concept of General Adaptation Syndrome

Hans Selye (1907-1982) started the modern era of research into something called stress. In 1950, Selye addressed the American Psychological Association convention. He described a theory of stress-induced responses that became the standard model of stress, the one people usually refer to (or criticize) in academic journal articles about stress.

How did Selye discover the stress response?

Selye's discovery of the stress response was an accident. He was doing research on the effect of hormone injections in rats. Initially he thought he detected a harmful effect from the hormones, because many of the rats became sick after receiving the injections. But when Selye used a control group of rats, injected only with a neutral solution containing no hormones, he observed that they became sick, too.

As it turned out, the rats responded more profoundly to the trauma of being injected than they did to the hormones. The experience of being handled and injected led to high levels of sympathetic nervous system arousal and eventually to health problems such as ulcers. (Note that stress was not found to directly cause ulcers by Selye.) Selye coined the term "stressor" to label a stimulus that had this effect.

What is a stressor for rats? For lab assistants?

The immediate response to stress is the release of adrenaline into the blood plasma (the liquid part of the bloodstream). "Mild stressors such as opening a cage door or handling a

rat produces an eightfold increase in plasma epinephrine [adrenaline] concentrations" (Axelrod and Reisine, 1984). The sentence is ambiguous; does the rat or the human experience the eightfold increase in adrenaline? In this case, it is the rat which is having its adrenaline (plasma epinephrine) measured. However, many lab assistants probably experience a burst of adrenaline, too, when handling a rat for the first time.

What were the three stages of Selye's General Adaptation Syndrome?

Selye proposed a three-stage pattern of response to stress that he called the General Adaptation Syndrome (GAS). He proposed that when the organism first encountered stress, in the form of novelty or threat, it responded with an alarm reaction. This is followed by a recovery or resistance stage during which the organism repairs itself and stores energy. If the stress-causing events continue, exhaustion sets in. This third stage is what became known popularly as burn-out. Classic symptoms of burn-out include loss of drive, emotional flatness, and (in humans) dulling of responsiveness to the needs of others.

Hans Selye's Study of Stress Response

In 1934, Hans Selye at McGill University discovered a new type of hormone. He gave rats daily injections of ovarian extract and found that the rats had enlarged adrenals and shrunken spleens, thymus, lymph nodes, and intestinal ulcers. "Multiple organs in the body generate this hormone, and thus he announced that it is a nonspecific response of body to noxious agents. (Evan-Martin, 2007)

In 1936, Selye defined these series of symptoms in the experiments with the rats as the General Adaptation Syndrome, which consists of three stages: the alarm stage, the resistance stage, and the exhaustion stage (Evan-Martin, 2007). The alarm stage is similar to the fight-or-flight response, and the body mobilizes resources to react to the incoming noxious agent. The resistance forces will be built up when the noxious challenge is detected as continuing. The exhaustion stage will cause death if the body is unable to overcome the threat.

For example, your mom told you that you are going to take the SAT next month. The first reaction is shock, starting complaints and feelings of stress, which represent the beginning of the first stage. In the resistance stage, you will try your best to do practice tests, reviewing vocabulary, studying any type of study aids that are available. Finally, you will feel like you are doomed to fail this test and feel desperate, feel constantly anxious, have difficulty falling asleep and waking up in the morning. The exhaustion of this stage will have deleterious effects on your health by depleting your body resources which are crucial for the maintenance of normal functions. Your immune system will be exhausted and function will be impaired. Also, the decomposition which is a functional deterioration of body may happen as the exhaustion stage extends. Selye believed that one becomes sick at that point because stored hormones secrete during the stress response are depleted (Sapolsky, 1998).

Section 3.6 Distress may be destructive to health

Hans Selye's research that led to the concept of the General Adaptation Syndrome (GAS) demonstrated that stress that is perceived as a threat (distress) may be debilitating if it is continuous. But even "flow" could go on too long and the person would need a break. But "flow" only develops in activities that are freely engaged in. Negative stress, or distress, is often part of activities that we perceive we cannot escape. Our bodies and minds seem to have evolved to cope well with sudden and brief stressors, such as escaping attack by a predator. We do not seem to be designed to handle chronic stress even if it is mild, like driving in heavy traffic. Our society has created many conditions that produce chronic stress and are associated with stress related illnesses. We have time pressures, work pressures, relationship pressures, crowding, noise, crime, to many things to do in too little time, achievement pressures, and even education-related pressures in this course. It is this detrimental effect of ongoing stress that underlies the GAS and the concepts of stress-induced health problems.

Section 3.7 Eustress

Hans Selye originally defined stress as the body's response to challenges. He was dismayed by the implication that all challenging events in life were unhealthy and undesirable. Stress was not always bad, he pointed out. Sometimes a challenge is a good thing. Indeed, one could argue that nothing useful in life can be accomplished without some degree of stress.

"Good stress," Selye pointed out, is "the spice of life." To combat the notion that all stress was bad, Selye developed the idea of eustress, which is a person's ideal stress level. Selye proposed that different people needed different levels of challenge or stimulation (stress) in their lives. Some people ("turtles") need low levels of stress. Others ("racehorses") thrive on challenges.

In the long run, the popular conception of stress as something bad proved to be more durable and accurate than Selye's notion of stress as a challenge to the system. In other words, the word stress continues to mean something bad (not something challenging) to most people. That seems to make the most sense, because psychologists found that only unpleasant stressors produced the harmful stress reaction identified by Selye (corticosteroid secretion). Challenges were not harmful in themselves. A person could be a busy executive or engage in strenuous exercise without experiencing negative stress-related symptoms, as long as the person enjoyed the challenge.

Section 3.8 Burnout and Stress Related Illness

Burnout syndrome is considered an important work-related illness in welfare societies. It was through observations by German psychologist Herbert Freudenberger inside a detoxification clinic in the mid-1960s that the first scientific descriptions came to light of staff affected by this disorder. It was only in the 1980s that evaluation criteria for the

syndrome became available, through the design of a standard measurement instrument, the Maslach Burnout Inventory or MBI.

Burnout is a psychosocial syndrome. It involves feelings of emotional exhaustion, depersonalization and diminished personal accomplishment at work. Emotional exhaustion is a situation where, owing to lack of energy, workers perceive they are no longer able to participate on an emotional level. Depersonalization entails the development of negative attitudes and feelings towards persons for whom work is done, to the point where they are blamed for the subject's own problems. Diminished personal accomplishment is a tendency in professionals to negatively value their own capacity to carry out tasks and to interact with persons for whom they are performed, and feeling unhappy or dissatisfied with the results obtained.

The MBI questionnaire has been adapted for application not only to human services professions but to all types of occupations in general. An updated definition of burnout, constructed using the latest version of the MBI, is that proposed by Maslach et al. In their description, it is "a prolonged response to chronic emotional and interpersonal stressors on the job, and is defined by the three dimensions of exhaustion, cynicism, and inefficiency." Exhaustion is the feeling of not being able to offer any more of oneself at an emotional level; cynicism is contemplated as a distant attitude towards work, the people being served by it and among colleagues; ineffectiveness is the feeling of not performing tasks adequately and of being incompetent at work.

Burnout is generally considered a response by a person to chronic work-related stress in an attempt to adapt or protect oneself from it. From a transactional approach, stress is defined as "the result of a relationship with the environment that the person appraises as significant for his or her well-being and in which the demands tax or exceed available coping resources." This is the case because a life event is not what produces stress; rather, it is caused by the appraisal the affected person makes of it. According to Lazarus and Folkman, coping is "cognitive and behavioral efforts to manage specific internal and/or external demands that are appraised as taxing or exceeding the resources of the person." A person will be psychologically vulnerable to a determined situation if he or she does not possess sufficient coping resources to handle it adequately, and if at the same time, he or she places considerable importance on the threat implicit in the consequences of this inadequate handling. From this perspective, burnout syndrome may be seen as a progressively-developed process resulting from the use of the relatively ineffective coping strategies with which professionals try to protect themselves from work-related stress.

Burnout has also been described as an experience where the worker is aware of considerable discrepancy between his or her efforts and the results, between the invested efforts and the rewards obtained at work. This phenomenological analysis framework is introduced into the subjective experience of those affected, and the conclusion is reached that the burnout process is triggered when the worker feels that his or her efforts are disproportionate to the gratification achieved, and consequently is no longer able to justify or cope with further investment of effort. Burnout syndrome may be seen as the

continuous perception that efforts made to carry out tasks are not effective, because expected gratitude, recognition or success at work are not being achieved.

This tool can help you check yourself for burnout. It helps you look at the way you feel about your job and your experiences at work, so that you can get a feel for whether you are at risk of burnout. Resource:

MindTools

http://www.mindtools.com/pages/article/newTCS_08.htm

Section 3.9 Common Causes of Stress

Stress happens when people feel like they don't have the tools to manage all of the demands in their lives. Stress can be short-term or long-term. Missing the bus or arguing with your spouse or partner can cause short-term stress. Money problems or trouble at work can cause long-term stress. Even happy events, like having a baby or getting married can cause stress. Some of the most common stressful life events include:

- Death of a spouse
- Death of a close family member
- Divorce
- Losing your job
- Major personal illness or injury
- Marital separation
- Marriage
- Pregnancy
- Retirement
- Spending time in jail

SOCIAL READJUSTMENT RATING SCALE*

LIFE EVENT	LIFE-CHANGE UNIT
Death of one's spouse	100
Divorce	73
Marital Separation	65
Jail Term	63
Death of a Close Family Member	63
Personal Injury or Illness	53
Marriage	50
Being Fired	47
Retirement	45
Pregnancy	40
Change in One's Financial State	38
More Arguments with One's Spouse	35
Change in Responsibilities at Work	29
Son or Daughter Leaving Home	29
Trouble with In-Laws	29
Beginning or Ending School	26
Change in Living Conditions	25
Trouble with One's Boss	23
Change in Work Hours or Conditions	20
Change in Eating Habits	15
Vacation	13
Christmas	12

Figure 1. Social Readjustment Scale

Section 3.10 Common signs and symptoms of stress

Everyone responds to stress a little differently. Symptoms may vary person to person. Here are some of the signs to look for:

- Not eating or eating too much
- Feeling like you have no control
- Needing to have too much control
- Forgetfulness
- Headaches
- Lack of energy
- Lack of focus
- Trouble getting things done
- Poor self-esteem
- Short temper
- Upset stomach
- Back pain
- General aches and pains

These symptoms may also be signs of depression or anxiety, which can be caused by long-term stress.

Section 3.11 Do women react to stress differently than men?

One recent survey found that women were more likely to experience physical symptoms of stress than men. But we don't have enough proof to say that this applies to all women. We do know that women often cope with stress in different ways than men. Women "tend and befriend," taking care of those closest to them, but also drawing support from friends and family. Men are more likely to have the "fight or flight" response. They cope by "escaping" into a relaxing activity or other distraction.

Section 3.12 Can Stress Affect My Health?

The body responds to stress by releasing stress hormones. These hormones make blood pressure, heart rate, and blood sugar levels go up. Long-term stress can help cause a variety of health problems, including:

- Mental health disorders, like depression and anxiety
- Obesity
- Heart disease
- High blood pressure
- Abnormal heart beats
- Menstrual problems
- Acne and other skin problems

Section 3.13 The Effect of Stress on the Immune System

Psychoneuroimmunology (PNI) is defined as the examination of the interactions among psychological, behavioral, and social factors with immunological and neuroendocrine

outcomes. It is now well established that psychological factors, especially chronic stress, can lead to impairments in immune system functioning in both the young and older adults. In several studies of older adults, those who are providing care for a relative with dementia report high levels of stress and exhibit significant impairments in immune system functioning when compared with noncaregivers. Stress-induced changes in the immune system may affect a number of outcomes, including slowing the wound healing process and increasing susceptibility to infections.

Section 3.14 Does stress cause ulcers? NO

A bacterium called Helicobacter pylori (H. pylori) is a major cause of peptic ulcers. Nonsteroidal anti-inflammatory drugs (NSAIDs), such as aspirin and ibuprofen, are another common cause. Rarely, cancerous or noncancerous tumors in the stomach, duodenum, or pancreas cause ulcers.

Peptic ulcers are NOT caused by stress or eating spicy food, but both can make ulcer symptoms worse. Smoking and drinking alcohol also can worsen ulcers and prevent healing.

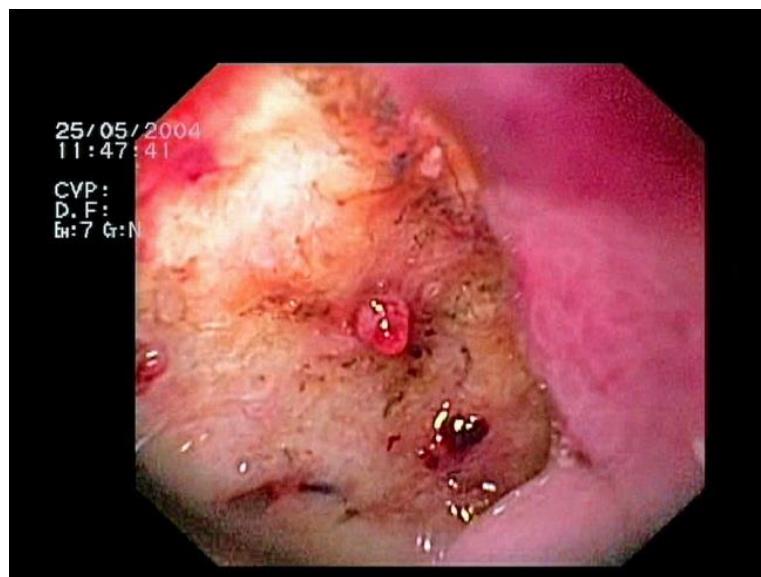


Figure 2. Ulcer

Section 3.15 Post-traumatic stress disorder (PTSD)

Post-traumatic stress disorder (PTSD) is a type of anxiety disorder that can occur after living through or seeing a dangerous event. It can also occur after a sudden traumatic event. This can include:

- Being a victim of or seeing violence
- Being a victim of sexual or physical abuse or assault

- The death or serious illness of a loved one
- Fighting in a war
- A severe car crash or a plane crash
- Hurricanes, tornadoes, and fires

You can start having PTSD symptoms right after the event or symptoms can develop months or even years later. Symptoms may include:

- Nightmares
- Flashbacks, or feeling like the event is happening again
- Staying away from places and things that remind you of what happened
- Being irritable, angry, or jumpy
- Feeling strong guilt, depression, or worry
- Trouble sleeping
- Feeling numb
- Having trouble remembering the event

Women are 2 to 3 times more likely to develop PTSD than men. Also, people with ongoing stress in their lives are more likely to develop PTSD after a dangerous event.

Section 3.16 Stress is in the Eye of the Beholder

The process by which we influence the emotion we experience in a situation by the interpretation or cognitions we select in the experience is described by Lazarus's theory of appraisal as influencing our stress experience. This theory may be beneficial to our understanding of the differences between individual's stress levels. The theory's main points are:

1. When we experience a situation or event we first determine if it is a threat, a challenge, or is neutral.
2. We then assess our inventory of resources to cope with the event. If we do not perceive we are adequate to the task, we must be able to withdraw or we will feel trapped in a situation with aversive consequences coming. That induces distress and all the physiological processes that harm our health. If we perceive that we have the resources to successfully cope with the situation, we feel challenged and optimistic. Note that challenge and optimism are related to enhanced health and sense of well-being.

This second stage of appraisal impacts the first stage in a loop process. If we at first perceive a threat but then realize we can handle it, it reduces the distress and may even create a perception of challenge. If at first we perceive a challenge but then realize that we don't have what it takes to be successful, we may begin to experience distress as we see the aversive outcome of failure looming ahead. Depending on the meaning of the outcome to us, the distress may be mild or severe. If the situation is always hanging over us and we

always feeling inadequate to it and anxious about negative outcomes, we are always under distress. Our health and well-being take a beating in that scenario.

Next, we must select from our repertoire of coping resources. There are two types of coping resources:

- Instrumental
- palliative (emotion-focused)

Instrumental coping solves the problem and removes the stressor from our experience as in working out a conflict with someone to reduce the distress or by getting a better job to reduce financial pressures.

Palliative coping alters our physiological reactions to stress that will not go away and cannot be escaped. These include relaxation skills, reinterpretation of the meaning or effects of the stressor, acceptance of the situation, or optimism about future improvements in the situation. Palliative skills would include relaxing in the traffic jam even though you have an important appointment that is being missed. You realize you cannot do anything about it, so you may as well relax because anger and tension will not make the cars move any faster, but it will hurt you, so you choose to relax instead.

As we go to our repertoire of coping skills to select one or more, we may become more optimistic of success and reappraise the situation in the first step. It may become less threatening and hence less distressful. We could find that our coping resources will be less adequate than we initially thought and we would become more threatened now. Even a challenge might be converted into a threat as in traveling to another country for the first time and finding your credit cards are missing and you have no money for anything and no way to get any.

This interactive appraisal and coping process is at the heart of the impact of stress on us. If we interpret a situation as stressful, it has the stress-related effects on us. If we have few coping sources, more situations will be perceived as distressing. If we have many coping resources, more situations will be perceived as challenging or at least neutral.

As I am driving down the road and have a flat tire, I could be annoyed at the trouble it causes or highly threatened by the memory of Bill Cosby's son's murder a few years ago as he changed his tire. If I don't know how to change a tire and it is night time, I may feel very threatened as I perceive helplessness and vulnerability to someone's attacking me. If I assure myself that this is unlikely, and I do know how to change a tire, I may decide that I will get this done in ten minutes and be on the road safely. But then I find that my spare tire is flat. Now I feel threatened for sure. But if I have a good spare, have a good flashlight, have a handgun and the skill to use it, and have changed many tires, I may only feel annoyed at the hassle and not feel threatened (many instrumental skills). I may have none of these things but have a cell phone and a close friend who will quickly be here to solve the problem for me (social support). My distress is much less then.

These factual situations are part of the appraisal and coping process. Perception is also critically important. If I have little confidence in myself to handle a flat tire even though I have been taught how to do it and have the tire, I may feel more threatened. If I have the cell phone but don't believe I should bother anybody to come here, or don't believe they would want to help me, the facts do not determine my reaction as much as my perception of the facts determines it.

A second example of the role of coping skills and perception could involve getting started in this course. If you are a computer whiz and have taken several college courses including online courses before, you got started with little problem. Learning to use Etudes, to take online quizzes probably did not cause much distress. But if you were new to using the Internet, had never taken an online course, and had low self-confidence, you may have been quite distressed. Same situation, different coping resources. Some of our community colleges go to great effort to be sure new online students have the knowledge and coping skills to begin a course with little stress.

Now add pure perception. If you perceive college as a supportive environment that will find a way to assist you to get through as long as you put forth the effort, and perceive instructors as willing to be flexible when circumstances are beyond all of our control, like getting started on the three programs we use and getting books late, you may be hassled but not threatened about failing the course because of these factors. But if you see colleges and instructors as money-hungry and deliberately placing obstacles in your path to cause you to fail and drop out, you have been very distressed when you had these difficulties as you would see no support or flexibility to allow you to adapt to the new situation and have the time to catch up. You might even feel quite angry at this new ploy to get your tuition and frustrate you into quitting. The reality of the college and instructor's intent make no difference in your initial perception and resultant choices. It is your perception of reality that determines what you will do.

The appraisal and coping process underlies the statement that "stress is in the eye of the beholder." Any event of situation may be perceived differently by different individuals due to past experience with it, learned skills, personality traits like Type A and optimism, and the amount of distress being experienced already. Social support may be instrumental in helping cope with problem as in coming to help with the flat tire, or being eager to listen and be supportive with your sharing your experiences. Both reduce the distress levels.

Section 3.17 Managing Stress

Everyone has to deal with stress. There are steps you can take to help you handle stress in a positive way and keep it from making you sick. Try these tips to keep stress in check:

Develop a new attitude

- Become a problem solver. Make a list of the things that cause stress. From your list, figure out which problems you can solve now and which are beyond your

control for the moment. From your list of problems that you can solve now, start with the little ones. Learn how to calmly look at a problem, think of possible solutions, and take action to solve the problem. Being able to solve small problems will give you confidence to tackle the big ones. And feeling confident that you can solve problems will go a long way to helping you feel less stressed.

- Be flexible. Sometimes, it's not worth the stress to argue. Give in once in a while or meet people halfway.
- Get organized. Think ahead about how you're going to spend your time. Write a to-do list. Figure out what's most important to do and do those things first.
- Set limits. When it comes to things like work and family, figure out what you can really do. There are only so many hours in the day. Set limits for yourself and others. Don't be afraid to say NO to requests for your time and energy.

Relax

- Take deep breaths. If you're feeling stressed, taking a few deep breaths makes you breathe slower and helps your muscles relax.
- Stretch. Stretching can also help relax your muscles and make you feel less tense. Massage tense muscles. Having someone massage the muscles in the back of your neck and upper back can help you feel less tense.
- Take time for yourself. We all have lots of things that we have to do. But often we don't take the time to do the things that we really want to do. It could be listening to music, reading a good book, or going to a movie. Think of this as an order from your doctor, so you won't feel guilty!

Take care of your body

- Get enough sleep. Getting enough sleep helps you recover from the stresses of the day. Also, being well-rested helps you think better so that you are prepared to handle problems as they come up. Most adults need 7 to 9 hours of sleep a night to feel rested.
- Eat right. Try to fuel up with fruits, vegetables, beans, and whole grains. Don't be fooled by the jolt you get from caffeine or high-sugar snack foods. Your energy will wear off, and you could wind up feeling more tired than you did before.
- Get moving. Getting physical activity can not only help relax your tense muscles but improve your mood. Research shows that physical activity can help relieve symptoms of depression and anxiety.
- Don't deal with stress in unhealthy ways. This includes drinking too much alcohol, using drugs, smoking, or overeating.

Connect with others

- Share your stress. Talking about your problems with friends or family members can sometimes help you feel better. They might also help you see your problems in a new way and suggest solutions that you hadn't thought of.

- Get help from a professional if you need it. If you feel that you can no longer cope, talk to your doctor. She or he may suggest counseling to help you learn better ways to deal with stress. Your doctor may also prescribe medicines, such as antidepressants or sleep aids.
- Help others. Volunteering in your community can help you make new friends and feel better about yourself.

Section 3.18 Coping with Stress

The effects of stress tend to build up over time. Taking practical steps to maintain your health and outlook can reduce or prevent these effects. The following are some tips that may help you to cope with stress:

- Seek help from a qualified mental health care provider if you are overwhelmed, feel you cannot cope, have suicidal thoughts, or are using drugs or alcohol to cope.
- Get proper health care for existing or new health problems.
- Stay in touch with people who can provide emotional and other support. Ask for help from friends, family, and community or religious organizations to reduce stress due to work burdens or family issues, such as caring for a loved one.
- Recognize signs of your body's response to stress, such as difficulty sleeping, increased alcohol and other substance use, being easily angered, feeling depressed, and having low energy.
- Set priorities-decide what must get done and what can wait, and learn to say no to new tasks if they are putting you into overload.
- Note what you have accomplished at the end of the day, not what you have been unable to do.
- Avoid dwelling on problems. If you can't do this on your own, seek help from a qualified mental health professional who can guide you.
- Schedule regular times for healthy and relaxing activities.
- Explore stress coping programs, which may incorporate meditation, yoga, tai chi, or other gentle exercises.
- Exercise regularly - just 30 minutes per day of gentle walking can help boost mood and reduce stress.

Section 3.19 Exercise and Stress

Exercise builds stronger bodies only if we push ourselves beyond our regular level of strength and endurance. Progressing in your intellectual skills occurs only by going beyond your adaptation level for the complexity and amount of knowledge you must acquire. Stress as "challenge" enhances physical and emotional well-being. Mountain climbers want risk and challenge, but they want the type that they feel they can master and mostly control. They don't want to be perfectly in control because then the challenge would not be so great. They want to be on the edge between in-control and having to use every degree of

skill, concentration, and problem solving to succeed. The same is true of race car drivers, downhill skiers, chess players, musicians, and artists.

These activities have been described by Csikszentmihalyi as inducing the experience of "flow" that totally captures the attention, makes it very easy to continue, and very hard to stop. There are many other activities and professions that produce "flow", but the essence of the experience is to be on the edge of challenge and failure with the perception that your own efforts will make the difference between good and bad outcomes. In these conditions stress builds healthier bodies and higher well-being. People who experience "flow" frequently report high degrees of satisfaction in life.

Physiological Toughness Model

There is also a psychophysiological framework for explaining how exercise cannot only reduce the immediate effects of stress but also can enhance the recovery from stressors. This framework is called the Physiological Toughness Model and it theorizes that intermittent but regular exposure to stressors, like exercise, can lead to psychological coping, emotional stability, and physiological changes. These physiological changes include increases in endorphins and reductions in stress hormones and lead to improvements in performance during challenging/threatening situations, strengthening of immune system functioning, and improvements in stress tolerance.

Section 3.20 Meditation and Health

Many people practice meditation for a number of health-related purposes. A 2007 national government survey found that 9.4% of respondents had used meditation in the past 12 months.

What is meditation?

The term meditation refers to a group of techniques which may be practiced for many reasons, such as to increase calmness and physical relaxation, to improve psychological balance, to cope with illness, or to enhance overall wellness. Most types of meditation have four elements in common:

- A quiet location. Meditation is usually practiced in a quiet place with as few distractions as possible. This can be particularly helpful for beginners.
- A specific, comfortable posture. Depending on the type being practiced, meditation can be done while sitting, lying down, standing, walking, or in other positions.
- A focus of attention. Focusing one's attention is usually a part of meditation. For example, the meditator may focus on a mantra (a specially chosen word or set of words), an object, or the sensations of the breath.

- Having an open attitude. During meditation this means letting distractions come and go naturally without judging them.

How can meditation affect my health?

It is not fully known what changes occur in the body during meditation; whether they influence health; and, if so, how. Research is under way to find out more about meditation's effects, how it works, and diseases and conditions for which it may be most helpful.

The National Center for Complementary and Alternative Medicine (NCCAM) is the federal government's lead agency for scientific research on complementary and alternative medicine (CAM). Some recent NCCAM-supported studies have been investigating meditation for relieving stress in caregivers for elderly patients with dementia and for relieving asthma symptoms.

Is meditation right for me?

Meditation is considered to be safe for healthy people, but if you are thinking about using meditation practices to prevent asthma attacks, to control high blood pressure, to reduce arthritis pain, or for any other medical reason, be smart.

Section 3.21 Relaxation Techniques

Relaxation techniques include a number of practices such as progressive relaxation, guided imagery, biofeedback, self-hypnosis, and deep breathing exercises. The goal is similar in all: to consciously produce the body's natural relaxation response, characterized by slower breathing, lower blood pressure, and a feeling of calm and well-being.

Relaxation techniques (also called relaxation response techniques) may be used by some to release tension and to counteract the ill effects of stress. Relaxation techniques are also used to induce sleep, reduce pain, and calm emotions. This fact sheet provides a general overview of relaxation techniques and suggests sources for additional information.

Key Points

- Relaxation techniques are used for a variety of health-related purposes, such as counteracting the effects of stress on the body.
- Most relaxation techniques can be self-taught and self-administered.
- Relaxation techniques are generally safe, but there is limited evidence of usefulness for specific health conditions. Research is under way to find out more about relaxation and health outcomes.
- Do not use relaxation techniques as a replacement for conventional care or to postpone seeing a doctor about a medical problem.
- Tell your health care providers about any complementary and alternative practices you use. Give them a full picture of what you do to manage your health. This will help ensure coordinated and safe care.

About Relaxation Techniques

Relaxation is more than a state of mind; it physically changes the way your body functions. When your body is relaxed breathing slows, blood pressure and oxygen consumption decrease, and some people report an increased sense of well-being. This is called the “relaxation response.” Being able to produce the relaxation response using relaxation techniques may counteract the effects of long-term stress, which may contribute to or worsen a range of health problems including depression, digestive disorders, headaches, high blood pressure, and insomnia.

Relaxation techniques often combine breathing and focused attention on pleasing thoughts and images to calm the mind and the body. Most methods require only brief instruction from a book or experienced practitioner before they can be done without assistance. These techniques may be most effective when practiced regularly and combined with good nutrition, regular exercise, and a strong social support system.

Some relaxation response techniques include:

- **Autogenic training:** When using this method, you focus on the physical sensation of your own breathing or heartbeat and picture your body as warm, heavy, and/or relaxed.
- **Biofeedback:** Biofeedback-assisted relaxation uses electronic devices to teach you how to consciously produce the relaxation response. Biofeedback is sometimes used to relieve conditions that are caused or worsened by stress.
- **Deep breathing or breathing exercises:** To relax using this method, you consciously slow your breathing and focus on taking regular and deep breaths.
- **Guided imagery:** For this technique, you focus on pleasant images to replace negative or stressful feelings and relax. Guided imagery may be directed by you or a practitioner through storytelling or descriptions designed to suggest mental images (also called visualization).
- **Progressive relaxation:** (also called Jacobson’s progressive relaxation or progressive muscle relaxation). For this relaxation method, you focus on tightening and relaxing each muscle group. Progressive relaxation is often combined with guided imagery and breathing exercises.
- **Self-Hypnosis:** In self-hypnosis you produce the relaxation response with a phrase or nonverbal cue (called a “suggestion”). Self-hypnosis may be used to relieve pain (tension headaches, labor, or minor surgery) as well as to treat anxiety and irritable bowel syndrome.

Use of Relaxation Techniques for Health in the United States

People may use relaxation techniques as part of a comprehensive plan to treat, prevent, or reduce symptoms of a variety of conditions including stress, high blood pressure, chronic pain, insomnia, depression, labor pain, headache, cardiovascular disease, anxiety, chemotherapy side effects, and others. According to the 2007 National Health Interview Survey, which included a comprehensive survey of complementary and alternative

medicine (CAM) use by Americans, 12.7 percent of American adults use deep-breathing exercises, 2.9 percent used progressive relaxation, and 2.2 percent used guided imagery for health purposes. Most of those people reported using a book to learn the techniques rather than seeing a practitioner.

To understand how consciously producing the relaxation response may affect your health, it is helpful to understand how your body responds to the opposite of relaxation—stress. When you're under stress, your body releases hormones that produce the “fight-or-flight response:” Heart rate and breathing rate go up and blood vessels narrow (restricting the flow of blood). This response allows energy to flow to parts of your body that need to take action, for example the muscles and the heart. However useful this response may be in the short term, there is evidence that when your body remains in a stress state for a long time, emotional or physical damage can occur. Long-term or chronic stress (lasting months or years) may reduce your body's ability to fight off illness and lead to or worsen certain health conditions. Chronic stress may lead to high blood pressure, headaches, stomach ache, and other symptoms. Stress may worsen certain conditions, such as asthma. Stress also has been linked to depression, anxiety, and other mental illnesses.

In contrast to the stress response, the relaxation response slows the heart rate, lowers blood pressure, and decreases oxygen consumption and levels of stress hormones. Because relaxation is the opposite of stress, the theory is that voluntarily creating the relaxation response through regular use of relaxation techniques could counteract the negative effects of stress.

Status of Research on Relaxation Techniques

In the past 30 years, there has been considerable interest in the relaxation response and how inducing this state may benefit health. Research has focused primarily on illness and conditions in which stress may play a role either as the cause of the condition or as a factor that can make the condition worse. Currently, there is some evidence that relaxation techniques may be an effective part of an overall treatment plan for some disorders, including:

- **Anxiety:** Studies have suggested that relaxation may assist in the treatment of phobias or panic disorder. Relaxation techniques have also been used to relieve anxiety for people in stressful situations, such as when undergoing a medical procedure.
- **Depression:** In 2008, a major review of the evidence for relaxation in the treatment of depression found that relaxation techniques were more effective than no treatment for depression, but not as effective as cognitive-behavioral therapy.
- **Headache:** There is some evidence that biofeedback and other relaxation techniques may be helpful for relieving tension or migraine headaches. In some cases, these mind and body techniques were more effective than medications for reducing the frequency, intensity, and severity of headaches.

- **Pain.** Some studies have shown that relaxation techniques may help reduce abdominal and surgery pain.

The results of research on relaxation to promote overall health or well-being or to treat other health conditions have been mixed or unclear. These conditions include:

- **High blood pressure:** A 2008 review of evidence for relaxation in the treatment of high blood pressure found some evidence that progressive muscle relaxation lowered blood pressure a small amount. However, the review found no evidence that this effect was enough to reduce the risk of heart disease, stroke, or other health issues due to high blood pressure. In a recent randomized controlled trial, 8 weeks of relaxation response/stress management was shown to reduce systolic blood pressure in hypertensive older adults, and some patients were able to reduce hypertension medication without an increase in blood pressure.
 - **Asthma:** Several reviews of the literature have suggested that relaxation techniques, including guided imagery, may temporarily help improve lung function and quality of life and relieve anxiety in people with asthma. A more recent randomized clinical trial of asthma found that relaxation techniques may help improve immune function. More studies are needed to confirm this finding.
 - **Nausea:** Relaxation techniques may help relieve nausea caused by chemotherapy. Fibromyalgia. Although some preliminary studies report that using relaxation or guided imagery techniques may sometimes improve pain and reduce fatigue from fibromyalgia, more research is needed. Irritable bowel syndrome. Some studies have indicated that relaxation techniques may prevent or relieve symptoms of irritable bowel syndrome (IBS) in some participants. One review of the research found some evidence that self-hypnosis may be useful in the treatment of IBS.
 - **Heart disease and heart symptoms:** Researchers have looked at relaxation techniques for the treatment of angina and the prevention of heart disease. When a cardiac rehabilitation program was combined with relaxation response training in a clinic, participants experienced significant reductions in blood pressure, decreases in lipid levels, and increases in psychological functioning when compared to participants' status before the program. Although studies have shown that relaxation techniques combined with other lifestyle changes and standard medical care may reduce the risk of recurrent heart attack, more study is needed.
- Insomnia:** There is some evidence that relaxation techniques can help in treating chronic insomnia.

Researchers have found some evidence on the effectiveness of relaxation techniques for:

- **Temporomandibular disorder:** (pain and loss of motion in the jaw joints). A review of the literature found that relaxation techniques and biofeedback were more effective than placebo in decreasing pain and increasing jaw function.

- **Ringing in the ears:** Use of relaxation exercises may help patients cope with the condition.
- **Smoking cessation:** Relaxation exercises may help reduce the desire to smoke.
- **Overactive bladder:** Bladder re-training combined with relaxation and other exercises may help control urinary urgency.
- **Nightmare:** Relaxation exercises may be effective in treating nightmares of unknown cause and those associated with posttraumatic stress disorder.
- **Hot flashes:** Relaxation exercises involving slow, controlled deep breathing may help relieve hot flashes associated with menopause.

Researchers have found no significant change in outcomes from relaxation techniques used during cardiac catheterization. However, patients experienced less distress prior to the procedure. Future research may investigate whether this has any long-term effect on outlook and recovery. Many of the studies of relaxation therapy and health have followed a small number of patients for weeks or months. Longer studies involving more participants may reveal more about the cumulative effects of using relaxation techniques regularly.

Side Effects and Risks

Relaxation techniques are generally considered safe for healthy people. There have been rare reports that certain relaxation techniques might cause or worsen symptoms in people with epilepsy or certain psychiatric conditions, or with a history of abuse or trauma. People with heart disease should talk to their doctor before doing progressive muscle relaxation. Relaxation techniques are often used as part of a treatment plan and not as the sole treatment for potentially serious health conditions.

If You Are Thinking About Using Relaxation Techniques for Health

- Do not use relaxation techniques as a replacement for conventional care or to postpone seeing a doctor about a medical problem.
- Ask about the training and experience of the practitioner or instructor you are considering for any complementary alternative medicine practice.
- Look for published research studies on relaxation for the health condition in which you are interested. Remember that some claims for using relaxation therapies may exceed the available scientific evidence.
- Tell all your health care providers about any complementary and alternative practices you use. Give them a full picture of what you do to manage your health. This will help ensure coordinated and safe care.

Section 3.22 Resilience

Resilience is the ability to:

- Bounce back
- Take on difficult challenges and still find meaning in life
- Respond positively to difficult situations
- Rise above adversity
- Cope when things look bleak
- Tap into hope
- Transform unfavorable situations into wisdom, insight, and compassion
- Endure

Resilience refers to the ability of an individual, family, organization, or community to cope with adversity and adapt to challenges or change. It is an ongoing process that requires time and effort and engages people in taking a number of steps to enhance their response to adverse circumstances. Resilience implies that after an event, a person or community may not only be able to cope and recover, but also change to reflect different priorities arising from the experience and prepare for the next stressful situation.

Resilience is the most important defense people have against stress.
It is important to build and foster resilience to be ready for future challenges.
Resilience will enable the development of a reservoir of internal resources to draw upon during stressful situations.

Research (Aguirre, 2007; American Psychological Association, 2006; Bonanno, 2004) has shown that resilience is ordinary, not extraordinary, and that people regularly demonstrate being resilient.

Resilience is not a trait that people either have or do not have.
Resilience involves behaviors, thoughts, and actions that can be learned and developed in anyone. Resilience is tremendously influenced by a person's environment.

Resilience changes over time. It fluctuates depending on how much a person nurtures internal resources or coping strategies. Some people are more resilient in work life, while others exhibit more resilience in their personal relationships. People can build resilience and promote the foundations of resilience in any aspect of life they choose.

Building Resilience

Developing resilience is a personal journey. People do not react the same way to traumatic events. Some ways to build resilience include the following actions:

- Making connections with others
- Looking for opportunities for self-discovery

- Nurturing a positive view of self
- Accepting that change is a part of living
- Taking decisive actions
- Learning from the past

The ability to be flexible is a great skill to obtain and facilitates resilience growth. Getting help when it is needed is crucial to building resilience. An approach to building resilience that works for one person might not work for another. People use varying strategies. Resilience involves maintaining flexibility and balance in life during stressful circumstances and traumatic events. Being resilient does not mean that a person does not experience difficulty or distress. Emotional pain and sadness are common in people who have suffered major adversity or trauma in their lives. Stress can be dealt with proactively by building resilience to prepare for stressful circumstances, while learning how to recognize symptoms of stress. Fostering resilience or the ability to bounce back from a stressful situation is a proactive mechanism to managing stress.

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CHAPTER 4: Relationships and Communication

Love and intimacy go hand in hand. Love is the physical, emotional, sexual, intellectual, or social affection one person holds for another. Concepts related to love include: adoration, desire, prefer, possess, care for, serve, and even worship. Intimacy, on the other hand, is a close relationship where mutual acceptance, nurturance, and trust are shared at some level. In order to understand love in human relationships, you must first understand how the socialized self either enhances or inhibits your capacity to love.

Your socialized self develops under the supervision of your caregiver or parent(s). When you were a newborn, you were totally dependent upon the adults in your life to take care of your needs and raise you in a safe environment. You had to be fed and clothed, bathed and held, and loved and appreciated. Your caregivers provided these basic needs in your early development, and during this time, attachments were formed. An attachment is an emotional and social bond that forms between one person and another. Humans are considered highly motivated to form attachments throughout their lives.

Attachments are crucial to human existence and are essentially the emotional context of those relationships we form in life. As an infant you learned to trust those who cared for you; you learned that they returned once they were out of view and were dependable. Eventually, as your cognitive development matures, your brain allows you to love the person you are attached to and to care for them—whether or not they are caring for you. You learn then that your attachments begin to facilitate your needs and wants being met. How you attached as an infant and young child shape (at least in theory) how you will likely attach as an adult. For example, if you had strong attachments in childhood, then forming adult relationships should be easier for you; if you had weak or interrupted attachments in childhood, then forming adult relationships would be more difficult.

As adults, one of the very first symptoms that you are falling in love is that you begin to feel better about yourself when you are with the other person. It can be argued that you can only be in love as much as your self will allow you to be. Why? Because intimacy develops along with love, and intimacy requires that you have the ability to be your true self with the other person.

Section 4.1 Theories of Love

Love is a multidimensional concept and psychologists and sociologists have defined it in a variety of ways over the years. John Lee is perhaps the most quoted researcher on love with his six love types. Lee assumed that we all shared six core components of love and that our current loving relationship can be assessed and measured. Lee also claimed that there are qualities of love types—some more long-lasting and supportive of relationships and some pathological and defective which inhibit relationships. Lee's love types are widely used to help people understand their love styles. Lee claimed that six types of love comprised our loving experiences.

Eros

Eros is the love of sensuality: sex, taste, touch, sight, hearing, and smell. Eros love is often what we feel when turned on. Eros love is neither good nor bad; it is simply part of the overall love composite we experience with another person.

Storgé

Storgé is the love of your best friend in a normal casual context of life. Storgé is calm and peaceful, surprising to some who might have simply hung out together at one point but suddenly discovered that their friendship deepened and became more important than other friendships. “We started needing to be together, talking on the phone for hours, and missing each other when apart,” are common descriptions of Storgé love.

Pragma

Pragma is the love of details and qualities in the other person. Pragma lovers are satisfied and attracted by the other because of their characteristics (e.g., athleticism, intelligence, wealth). Pragma lovers feel love at a rational level—thinking to a certain degree about the good deal.

Agapé

Agapé is the love that is selfless, other-focused, and seeks to serve others rather than receive from others. In Christian theology it's the love of God for mankind.

Ludis

Ludis is an immature love that is more of a tease than a legitimate loving relationship. Ludic lovers trick their mates into believing that they are sincerely in love, while grooming 1, 2, or even 3 other lovers at the same time. Ludic lovers typically artificially stroke their sense of self-worth by playing a cruel game on their lovers who end up feeling used and betrayed.

Mania

Mania is an insecure love that is a mixture of conflict and artificially romantic Eros expressions. Manic lovers fear abandonment and are simultaneously terrified by the vulnerabilities they feel when intimate with their lover. Thus, their daily routines typically involve extreme highs and lows including arguing, making love, sweet-talking, and fighting with their lovers.

Abraham Maslow, addressed love in terms of how our needs are met by the other person. His basic premise is that we pair-off with those whose love styles fill an unmet childhood need. In other words, Maslow said that if our childhood needs were not met in the basics of

survival, safety, food, shelter, love, belonging, and even self-esteem, then we look for an adult companion that can fill those needs for us. It's like an empty cup from our childhood that our adult partner fills for us. Maslow also said that when all those basic needs are met in childhood, we are attracted to an adult partner who complements our full development into our psychological potential.² If in your childhood, your survival, safety, food, shelter, love, belonging, and even self-esteem needs were unmet then you will be attracted to a deficiency lover. Deficiency lovers are lovers who provide the basic level of needs for their partner while having their needs reciprocally met in a similar way. Being lovers meet their partner's aesthetic, intellectual, and physical needs while reciprocally having their needs met.

Sternberg's Triangular Theory of Love

Robert Sternberg was the "Geometry of Love" psychologist who triangulated love using intimacy, passion, and commitment by measuring the intensity of each and how intense the triangulation was for the couple. To Sternberg it was important to consider how each partner's triangle matched the other partner's. He said that a couple with all three types of love balanced, and in sufficient magnitude, would have a rare yet rewarding type of love that encompassed much of what couples seek in a loving relationship.³ Sternberg's consummate love is a love type that had equal measures of passion, intimacy, and commitment that is satisfactory to both lovers.

In modern day applications of love, various components have been found as the ingredients of love: commitment, passion, friendship, trust, loyalty, affections, intimacy, acceptance, caring, concern, care, selflessness, infatuation, and romance. There is a love type identified that many people are aware of called unconditional love. Unconditional love is the sincere love that does not vary regardless of the actions of the person who is loved. You often hear it expressed in greater measure among parents of children whose misbehaviors embarrass or disappoint them. The love types and patterns discussed below are taken from many sources, but fit neatly into the Lee, Maslow, Sternberg, or Chapman paradigms.

Romance

Romantic love is based on continual courtship and physical intimacy. Romantic lovers continue to date long after they marry or move in together. They often express the strong sexual attraction to each other that was there from the beginning. Romantic lovers are idealistic about their relationship and often feel that it was destined to be. They often define mundane activities such as grocery shopping or commuting to work as escapades of two lovers.

Infatuation

What happens when very young people feel love for the first time? What is puppy love or infatuation? Infatuation is a temporary state of love where the other person is overly idolized and seen in narrow and extremely positive terms. An infatuated person might think obsessively about the other, may feel a strong emotional response when they are together, may see their entire world as revolving around the other, may see them being

together for the rest of their lives, may find one or two qualities of the other as being near perfect, or may be seen by others as having a crush on the other person. Regardless of the details infatuations rarely last very long. This love develops quickly much like a firework launches quickly into the night sky, puts on an emotional light show, then burns out quickly. Many define puppy love or infatuation as an immature love experienced by those who are younger and perhaps a bit credulous.

Commitment

Committed love is a love that is loyal and devoted. Two lovers may share committed love with or without: physical affection, romance, friendship, trust, loyalty, acceptance, caring, concern, care, selflessness, and or infatuation. Committed lovers have a long-term history with one another and typically combine care-giving, concern for one another's well-being, and spending much time thinking of the other. Committed lovers are there when needed by the other person.

Altruism

Altruism is a selfless type of love that serves others while not serving the one who is altruistic. True altruism is hard to find according to some. Mothers who tend their sick child throughout the night; fathers who work 3-4 decades in a job they don't love to provide for their family; and even fire fighters who sacrifice their safety to save the lives of others are all considered to be altruistic in their actions. Because so much of what we do in our relationships is considered in the larger overall equation of the fairness in a relationship, selfless acts can be seen as acts which either build a reservoir of goodwill which will later be repaid or creating a debt of sorts in which the other person owes you some selfless service in return.

Passion

Sexual or passionate lovers are focused on the intensely sensual pleasures that are found with the senses of taste, smell, touch, feel, hear, and sight. Sexual lovers lust one another and feel closest when together and being physical. Sexual lovers can be together for five minutes, five days, five weeks, or five years, but sexual love, by itself is typically short-lived. There is closeness during sex and activities leading up to sex, but not much thereafter. Sexual love when combined with other love types can be very beneficial to the couple. Sexual love is almost always the love type experienced by those having an extra-marital affair.

Friendship

Friendship love includes intimacy and trust among close friends. Today, most long-burning or enduring love types form among people who were first close friends. Friendship lovers tend to enjoy each other's company, conversation, and daily interactions. They consider one another to be "go-to" friends when advice is needed or when problems need to be talked about together. Not all friendship lovers become a couple. Many are just close or best friends. Yet many who spend the rest of their lives together will start out their relationship as friends.

Realistic Love

Criteria or realistic love is the love feelings you have when your list of a potential mate's personal traits is met in the other person. For example, women often desire their male love companions to be taller. Men and women often desire to find a partner with homogamous traits (e.g., same religion, political leanings, hobbies, etc.).

Obsession

Obsessive love is an unhealthy love type where conflict and dramatic extremes in the relationship are both the goal and the theme of the couple's love. Obsessive lovers live for storms and find peace while they rage. They are often violent or overly aggressive at different levels. Sometimes couples bring complimentary traits to the relationship which light the other's fire of madness. In other words, she may be angry and violent with him, but not with some other males. He may feel simultaneously drawn to her and repulsed, but not with other females. Their personality-chemistry contributes to the insanity and lack of peace. These couples most likely need professional counseling and would probably be better off if they broke up. At the same time, why would they seek help or leave the person whose entanglements bring them such an occupation with drama and conflict that they are freed from their boredom and entertained at the same time?

Section 4.2 THEORIES OF MATE SELECTION

The Social Exchange Theory and its rational choice formula clarify the selection process even further. We strive to maximize rewards and minimize costs in our choices of a mate.

Rewards – Costs = Choice

When we interact with potential dates and mates, we run a mental balance sheet in our heads. She might think, "He's tall, confident, funny, and friends with my friends." As she talks a bit more she might say, "But, he chews tobacco, only wants to party, and just flirted with another woman while we were talking." The entire time we interact with potential dates and mates we evaluate them on their appearance, disposition, goals and aspirations, and other traits. This while simultaneously remembering how we rate and evaluate ourselves. Rarely do we seek out the best looking person at the party unless we define ourselves as an even match for him or her. More often we rank and rate ourselves compared to others and as we size up and evaluate potentials we define the overall exchange rationally or in an economic context where we try to maximize our rewards while minimizing our losses.

The overall evaluation of the deal also depends to a great extent on how well we feel matched on racial and ethnic traits, religious background, social economic class, and age similarities. The complexity of the date and mate selection process includes many obvious and some more subtle processes that you can understand for yourself. If you are single you can apply them to the date and mate selection processes you currently pursue.

How do strangers transition from not even knowing one another to eventually cohabiting or marrying together? From the very first encounter, two strangers begin a process that either excludes one another as potential dates or mates or includes them and begins the process of establishing intimacy. Intimacy is the mutual feeling of acceptance, trust, and connection to another person, even with the understanding of personal faults of the individual. In other words, intimacy is the ability to become close to one another, to accept one another as is, and eventually to feel accepted by the other. Intimacy is not sexual intercourse, although sexual intercourse may be one of many expressions of intimacy. When two strangers meet they have a stimulus that alerts one or both to take notice of the other.

Effective Communication

Effective communication is critical to successful relationships. Researchers and therapists have found at least nine skills that can help couples learn to talk effectively about important issues (Gottman 1994; Markman, Stanley, and Blumberg 2010; Schramm and Harris 2011). How we interact about issues such as time spent together/apart, money, health, gender differences, children, family, friends, commitment, trust, and intimacy affects our ability to develop and maintain lasting marital friendships. If learned well, these nine skills can help put our relationships on a positive trajectory for success. (Note: The word "marriage" is interchangeable with "relationship," if you are not married.)

What Do Couples Talk About?

- Time Together/Apart. Both the quantity and quality of time we spend together influence the wellbeing of our marital friendships. Spending time apart participating in other activities also influences the well-being of our relationships.
- Money. How we think and talk about money, our spending habits, and our ability to budget, invest, and plan for the future impact couple financial management processes and practices.
- Health. Couples must talk about many health-related issues, including nutrition, exercise, illness, disease, accidents, health care, mortality, and death.
- Men/Women. Because men tend to be more task-oriented in their communication styles and women tend to be more process-oriented, men tend to want to solve issues immediately, while women tend to want to talk about them more and come to a consensus about what should be done.
- Children. How children develop physically, socially, emotionally, intellectually, and spiritually are often topics of discussion. Focusing on the best ways to consistently meet children's needs is considered being child-centered.
- Family/In-Laws/Friends. Couples often talk about situations and circumstances surrounding the interactions they have with their closest relationships.

What do couples communicate when they are communicating?

- Commitment. How we "hang in there" and contribute to our marital friendship, even when things aren't going particularly well, is a sign of how committed we are to our relationship. Loyalty and fidelity are aspects of commitment and trust.
- Trust. Trusting relationships are relationships in which both partners are dependable, available to support each other, and responsive to each other's needs. An ability to negotiate conflict and a positive outlook about the future of the relationship are also components of trust.
- Intimacy. The social, intellectual, emotional, spiritual, and physical connections we make with each other determine the levels of intimacy we experience in our relationships.

What do couples argue about?

Because the items listed above are some of the major topics couples talk about, it follows that they are also the same topics that can spur disagreements. For instance, it is a familiar joke that people can have difficulties in their relationships with in-laws. Take for example, "What is the difference between in-laws and outlaws? Answer: One is 'Wanted!'" Sayings such as these underscore the importance of knowing how your relationships with others can affect your marriage and could potentially become the topic of a marital conflict.

Learning and Practicing New Habits

Effective communication isn't easy. Teaching and learning new communication skills take patience, patience, patience, as well as practice, practice, practice. Taking the time to talk is important. Your relationship provides a safe place to share feelings, thoughts, fears, dreams, and hopes. Make a special effort to find time to talk to your partner more frequently. In tough times, people feel overwhelmed with worries and responsibilities.

Time together as a couple is often the last thing on our minds as we deal with the hassles of daily life. Although you may be busy, stressed, and worried, take the time to focus on your partners' needs and spend quality time together without interruption. Even a few minutes a day talking about what has occurred can be a relief from stress. Be thoughtful by considering whether those difficult or problem-solving discussions could be reserved for other times when you and your partner are not tired or distracted.

You may need to be the one who starts conversations. It is worth it to be the one who initiates conversations. You can find many ways to open the door for communication if you are sensitive to changes in your partner's feelings and needs. Taking the time to listen keeps the lines of communication open and improves your relationship.

Finding Time to Talk

- Spend time talking with limited interruptions.

- Make a date to talk to your partner.
- Plan at least one routine family time each week.
- Talk instead of watching TV.
- Talk when you take a walk together.
- Talk while you work together on household chores.
- Talk in the car while traveling to activities.

Summing It Up

In good times and bad, couples need each other. Good communication does not mean that your family won't have any problems, or that your partner will always like what you have to say. Good communication means the chances of solving problems are much higher if you and your partner can express yourselves openly and freely with each other.

For couples today, there is an abundance of information on how to sustain healthy, happy marital relationships. From how-to books to advice given on television and radio, couples are bombarded with strategies, tips, and techniques focused on "what to do" in their relationships. Most of this information assumes that if couples follow a few short rules, then they can have happy relationships. What most fail to realize is that these new, positive practices won't work without recognizing and addressing what has been done and what is not working. Most information available to couples falls short on giving examples of "what not to do" in a relationship. Communication is the key, but it is difficult to apply effective strategies to harmful interactions.

Four negative patterns of interaction have been demonstrated as major destroyers of marital relationships:

- Criticism
- Contempt
- Defensiveness
- Stonewalling

Criticism

Criticism is using hurtful or judgmental comments aimed at your partner's character or personality. With criticism, the blame is placed on the person and not the problematic behavior. Criticism tends to be a repetitive cycle—a single critical moment can end up in a continued exchange. Most critical statements can be recognized by the phrases, "you always" or "you never." The following are some examples of criticism:

- You never finish any project that you start. You're so lazy.
- When we go out to eat, you always embarrass me with your table manners.

Contempt

Contempt is a more complex negative interaction. It is an effort to psychologically abuse your partner through disrespectful statements and actions. Contempt has both verbal and

non-verbal deliveries. Verbal examples of contempt include sarcasm, hostile humor, and mockery. For example, nonverbal displays of contempt include rolling of the eyes and sucking of the teeth during conflict. Contempt sends your partner a message of scorn—that they are inferior and worthless.

Defensiveness

Defensiveness is often a natural response to receiving criticism and contempt. When faced with criticism and contempt, most people find a need to defend themselves. However, couples can be defensive even when criticism is constructive. Defensiveness may be a response to previous, current, and/or future attacks. If one or both persons are acting defensively, it is most likely the case they are not listening. Defensiveness may take many forms including:

- Making excuses for behavior
- Repeating a statement for effect
- Denying responsibility for actions
- Answering a complaint with another complaint

Stonewalling

The final negative pattern of interaction is stonewalling. As the name implies, this occurs when partners “put a wall” around themselves, either physically or psychologically.

Stonewalling is often used to decrease conflict, and when delivered in moderation, can be healthy. On the other hand, continual failure to respond and/or engage in conversation escalates rather than reduces conflict. Examples of stonewalling include:

- Leaving the room
- Putting a physical barrier between you and your partner (newspaper, book, child)
- Focusing intently on something other than your partner during a discussion
- Failure to actively listen
- Responding with a blank stare

What can be done?

All of the above can become patterns of interaction within a relationship. One negative interaction leads to another, often in a repetitive cycle. The following suggestions can be used to break the cycle and promote a healthy relationship:

1. Eliminate criticism. Use complaints. It is okay to complain about troublesome behaviors. Discussing your feelings about the behavior is okay as long as there are no personal attacks. Use the word I instead of you and describe how the behavior makes you feel. Talk about the behavior and not the person.

Example: “When we go out to eat, you always embarrass me,” becomes “I feel hurt and ashamed when you make fun of me in public.”

2. Build on your friendship base. Validate your partner and his/her feelings, thoughts, needs, and desires, etc.

Ex. "I recognize that you need to talk more about our relationship. What is on your mind?"

3. Take accountability and responsibility for your own actions. Do not make excuses.
Apologize and correct the behavior (if possible).

Example: "I'm sorry that I yelled at you earlier. I've been under a lot of pressure at work, but it is unfair to take it out on you."

4. Use reflective listening. Repeat what your partner has stated and then respond. Show them that you are listening and hearing them.

Example: Partner 1: I would appreciate it if you would talk to me before you discipline the kids. That way we can be a united front."

Partner 2: What I'm hearing is that you would like for us to talk about disciplining the kids before I make any decisions. I think that is a good idea.

5. Continue dating. Make a point to rekindle the dating aspect of your relationship.

Ex. Go for walks, hold hands, act silly, etc. Find ways to show appreciation to your partner throughout the day (i.e., e-mails, notes, phone calls, etc.)

6. Seek help if needed. If you can identify these negative interactions in your relationship or you think you may need help, see a licensed marriage and family therapist or other professional. Do not try and fix everything on your own.

Example: Talk to a trusted family member, friend, or your local extension agent in order to find resources in your area.

Before a couple can learn and/or practice new routines in their relationship, they must rid themselves of the old ways that aren't working. It is important to first identify negative patterns and destructive behaviors and target them for change. At that point, the couple can begin rebuilding their relationship.

Section 4.3 Marriage

Marriage is very popular among U.S. adults, in part because it does offer many rewards that unmarried people don't enjoy. Marriage has become socially controversial in part because of the intense political efforts to legalize marriage for same-sex couples. Regardless of your moral position on the issue of same-sex marriage, you can see the political quest for it as an indicator of just how rewarding it is to be legally a "married couple."

There are numerous studies and books on the benefits of marriage to married individuals. Below are the Top Ten Benefits of Being Married in Contrast to Being Single:

1. Better physical and emotional health
2. More wealth and income
3. Positive social status
4. More and safer sex
5. Life-long continuity of intimate relationships
6. Safer circumstances for children

7. Longer life expectancy
8. Lower odds of being crime victims
9. Enhanced legal and insurance rights and benefits (tax, medical, and inheritance)
10. Higher self-reported happiness

Marriage is a legal union between a man and a woman as recognized by most of the United States. Internationally, and in certain U.S. political regions, a man and another man or a woman and another woman can be legally recognized as a married couple. What are typical marriage structures? The U.S. and world-wide culturally preferred marriage type today is monogamy. Monogamy is the marriage form permitting only one spouse at a time. Almost all who have married in the U.S. have done so monogamously since the original colonies in the 1600s. Monogamy implies a 1:1 relationship and is typically desired both by married couples and by opposite and same-sex cohabiters.

Polygyny is a form of marriage permitting more than one wife at the same time. Polygyny is still common and legal in many African, Middle Eastern, Muslim, and Indian nations. It was a deep part of China's history and prior to World War II it was common for a Chinese man to have multiple wives and many children.

Polyandry is a marriage form permitting more than one husband at the same time. This is historically and currently rare, and, if or when it was practiced, it often includes the marriage of one wife to a set of brothers with all husbands having sexual access to the wife. Polyandry was found among some Pacific Island cultures and among the pre-Taliban Afghans.

What if a person marries, divorces, marries, divorces, etc.? Serial Monogamy or Serial Polygamy is the process of establishing intimate marriage or cohabiting relationships that eventually dissolve and are followed by another intimate marriage or cohabiting relationship that eventually dissolve, etc. in a series. Thus polygamists have simultaneous multiple spouses while serial monogamists or serial polygamists have multiple spouses in a sequence of relationships. Millions of U.S. adults will experience serial marriages and divorces. Many marry then divorce, yet still want to be married again. Many others who suffered through their parents' unhealthy marriages and divorces also want to marry, knowing firsthand how risky that might be.

Section 4.4 Cohabitation

Cohabitation is the heterosexual, bisexual, and homosexual moving in together of two partners without going through the formalities of legal marriage. Although similar in form and function, cohabitating couples live differently in many significant day-to-day aspects when compared to married couples. Also, many cohabitating couples eventually choose to marry, but their risk of divorce is higher than among couples that never cohabited.

Cohabitation has been studied extensively for the last three decades, especially in contrast between cohabiting and married couples. Clear findings consistently show that cohabiting

and marriage are two different creatures. Those who cohabit have less clarity on the intention and direction of the relationship than do marrieds. Further, people who cohabit, then later marry, are more likely to divorce than those who never cohabited. In 2010 the U.S. Center for Disease Control reported that cohabitation is very common "Among both men and women aged 15-44 who had ever cohabited and or married, the largest proportion cohabited before their first marriage. Approximately 28% of men and women cohabited before their first marriage, whereas 23% of women and 18% of men married without ever cohabiting. About 15% of men and women had only cohabited (without ever marrying), and less than seven percent of men and women first cohabited after their first marriages ended." This report also stated that some of the cohabitation relationships dissolved while others transitioned to marriage. Less educated cohabiters cohabited longer while college- graduated cohabiters transitioned to marriage more.

Section 4.5 Marrieds and Non-Marrieds

There are known benefits to being married and in a long-term relationship rather than being single, divorced, or cohabiting. The list below shows health benefits from the cohabitation and marriage study of the National Survey of Family Growth. Better mental and physical health with better medical insurance coverage prove to be crucial qualities for marrieds. As far as children are concerned, having better care and better adult outcomes are crucial factors.

Health Benefits Known to be an Advantage among Married Persons in the U.S.

1. Generally better mental and physical health outcomes
2. Longer lives
3. Higher rates of health insurance coverage
4. Lower prevalence of cardiovascular disease
5. Better health and well-being of children
6. Children born to unmarried mothers are at greater risk for poverty, teen childbearing, poor school achievement, and marital disruption in adulthood than children born to married mothers

There are also known financial benefits when comparing marrieds to non-marrieds. More wealth accumulation, higher assets, and higher monthly income are consistent among marrieds. The first thing you notice is that marrieds have consistently higher annual incomes. In 2007 specifically, marrieds had \$28,231 more income than single men and \$42,293 more than single women. The difference is even more pronounced if both incomes are taken into consideration for dual income marrieds (i.e., in 2007 dual income couples had \$86,435 which is \$42,077 higher than single men and \$56,139 more than single women).

Married people are also safer and less prone to get into trouble than others. There is a buffering effect that accompanies having a life-long devoted spouse who helps deflect

stress and hardships on a daily basis. Thus some of the health benefits of longer life, less suicide, more stable health coverage, and less illness and addiction. Also, marrieds have more social support, more continuity in long-term relationships, and especially more closeness for men in intimate family relationships. Husbands are less likely to abuse and be violent toward their wives than are boyfriends and partners. Married people have clear life-long goals and tend to buy homes, invest, and plan for retirement more than others. The government and military recognize spouses and reward them with tax breaks, benefits, and other sources of coverage and support more than others. In later life, many elderly report that their family relationships are very supportive and important to them. Studies show that the elderly enjoy their human investment in their children and grandchildren that yields emotional and social rewards throughout their golden years.

Known Benefits Enjoyed by Married Couples in Comparison to Non-Married Persons.

1. Less likely to become victims of crime
2. Less likely to commit crimes
3. Less addiction
4. Fewer accidents (especially among men)
5. Less suicide
6. Better stress management because spouse is a buffer to life's stresses
7. More social and emotional support (less loneliness)
8. More intimate connections to family members
9. Long-term continuity in family relationships of children, in-laws, grandchildren, etc.
10. Lower risk of domestic violence for women
11. Longer life expectancies
12. More and better self-rated sex
13. More emotional and financial security (for both spouses)
14. Less uncertainty about direction of life and goals
15. More cost effective to live in married versus single circumstances
16. Tax deductions
17. More military benefits
18. More accumulated belongings and investments
19. More medical benefits
20. More legal rights

To legally marry in the United States today, one simply goes to the local county or state office and applies for a state marriage license. The state also claims authority in granting divorce rights to couples. Divorce is the legal dissolution of a previously granted marriage. Most marriages still endure, and the odds are that divorce won't happen to most marriages. It is a myth that one in two marriages eventually ends in divorce. There are a few myths about U.S. divorce trends that will be dispelled in this chapter. You might have heard the myth of the Seven Year Itch where divorce happens prior to or shortly after the 7th year. Current government estimates indicate that about 75% of couples make their ten-year anniversary in their first marriage. The myths are false, but divorce does happen more

today than it did 50 years ago and more people today are currently divorced than were currently divorced 50 years ago.

Ten Actions to Minimize the Risk of Divorce.

1. Wait until at least 20 years old to marry, 25 is better.
2. Avoid premarital pregnancy and don't marry just because of a pregnancy.
3. Become proactive in maintaining your marriage (books, seminars, counseling).
4. Understand risks of cohabitation (cohabitation ≠ divorce).
5. Once married, leave the marriage market; don't keep an eye open for something better.
6. Learn to compromise with each other. Work around those irreconcilable differences.
7. Keep a positive outlook and look beyond today.
8. Take your time in selecting a mate. Don't rush into marriage.
9. Take the media with a grain of salt. Don't assume your marriage will be like the headlines.
10. Focus on the positive benefits of being married and don't dwell on the negatives.

Section 4.6 Violence in Relationships

Violence is a serious public health problem in the United States. From infants to the elderly, it affects people in all stages of life. In the United States, violence accounts for approximately 51,000 deaths annually. In 2007, more than 18,000 people were victims of homicide and more than 34,000 took their own life.

Estimating the size of this economic burden is helpful in understanding the resources that could be saved if cost-effective violence prevention efforts were applied. The cost of these deaths totaled to \$47.2 billion (\$47 billion in work loss costs and \$215 million in medical treatment).

The number of violent deaths tells only part of the story. Many more survive violence and are left with permanent physical and emotional scars. Violence also erodes communities by reducing productivity, decreasing property values, and disrupting social services.

Understanding Violence

Interpersonal violence is defined as the actual or threatened intentional use of force—physical, sexual, or emotional—against another person, group, or community. It may result in physical injury, psychological harm, or even death. Violence also includes suicide and nonfatal acts of self-harm.

Unfortunately, violence is a part of our daily life. It exists in all corners of our nation. It affects us all regardless of our age, gender, race, ethnicity, or socio-economic status. More than 50,000 violent deaths occur each year in the United States. The deaths only tell part of the story. Millions of others are left with debilitating physical and emotional injuries. These injuries negatively affect the health of victims for the rest of their lives.

Violence also erodes the fabric of our communities. It can threaten productivity in the

workplace, decrease the value of our homes and businesses, and disrupt essential public and social services. The economic cost of violence is staggering. In 2000, the medical costs and productivity losses associated with nonfatal violence-related injuries and deaths were estimated at more than \$70 billion each year. The total burden to society is far greater.

The good news is that violence is a problem with a solution. It can be prevented by using a thoughtful and systematic approach. While the field of violence prevention is still developing, our knowledge of “what works” increases every day.

Types of Violence

- Child Maltreatment (e.g., child abuse and neglect)
- Intimate Partner Violence (e.g., violence by a current or former spouse, boy/girlfriend)
- Sexual Violence (e.g., rape, sexual assault, sexual harassment)
- Suicide (e.g., fatal and nonfatal suicide behavior)
- Youth Violence (e.g., bullying, gang violence, peer violence)

Section 4.7 Sexual Violence

Sexual Violence (SV) refers to sexual activity where consent is not obtained or freely given. Anyone can experience SV, but most victims are female. The person responsible for the violence is typically male and is usually someone known to the victim. The person can be, but is not limited to, a friend, coworker, neighbor, or family member.

There are many types of SV. Not all include physical contact between the victim and the perpetrator (person who harms someone else) – for example, sexual harassment, threats, and peeping. Other SV, including unwanted touching and rape, includes physical contact.

SV can impact health in many ways. Some ways are serious and can lead to long-term health problems. These include chronic pain, headaches, stomach problems, and sexually transmitted diseases.

SV can have an emotional impact as well. Victims often are fearful and anxious. They may replay the attack over and over in their minds. They may have problems with trust and be wary of becoming involved with others. The anger and stress that victims feel may lead to eating disorders and depression. Some even think about or attempt suicide.

SV is also linked to negative health behaviors. For example, victims are more likely to smoke, abuse alcohol, use drugs, and engage in risky sexual activity.

Why is sexual violence a public health problem?

SV is a significant problem in the United States:

- Among high school students surveyed nationwide, about 8% reported having been forced to have sex. The percentage of those having been forced to ever have sex was higher among female (11%) than male (5%) students.
- An estimated 20% to 25% of college women in the United States have experienced an attempted or complete rape during their college career

- Nearly 1 in 5 women and 1 in 71 men in the United States have been raped at some time in their lives.

These numbers underestimate the problem. Many cases are not reported because victims are afraid to tell the police, friends, or family about the abuse. Victims also think that their stories of abuse will not be believed and that police cannot help them. They may be ashamed or embarrassed. Victims may also keep quiet because they have been threatened with further harm if they tell anyone.

Certain factors can increase the risk for SV. However, the presence of these factors does not mean that SV will occur.

Risk factors for perpetration (harm to someone else):

- Being male
- Having friends that are sexually aggressive
- Witnessing or experiencing violence as a child
- Alcohol or drug use
- Being exposed to social norms, or shared beliefs, that support sexual violence.

It is important to understand what factors protect people or put them at risk for experiencing or perpetrating violence. Why are risk and protective factors useful? They help identify where prevention efforts need to be focused.

Risk factors do not cause violence. The presence of a risk factor does not mean that a person will always experience violence. Victims are never responsible for the harm inflicted upon them.

- Risk Factor - Characteristic that increases the likelihood of a person becoming a victim or perpetrator of violence.
- Protective Factor - Characteristic that decreases the likelihood of a person becoming a victim or perpetrator of violence because it provides a buffer against risk.

How can we prevent sexual violence?

The ultimate goal is to stop SV before it begins. Efforts at many levels are needed to accomplish this. Some examples include:

- Engaging high school students in mentoring programs or other skill-based activities that address healthy sexuality and dating relationships.
- Helping parents identify and address violent attitudes and behaviors in their kids.
- Creating policies at work, at school, and in other places that address sexual harassment.
- Developing mass media (e.g., radio, TV, magazines, newspapers) messages that promote norms, or shared beliefs, about healthy sexual relationships.

Sexual Violence: Risk and Protective Factors

Risk factors are associated with a greater likelihood of sexual violence (SV) perpetration. They are contributing factors and may or may not be direct causes. Not everyone who is

identified as "at risk" becomes a perpetrator of violence.

A combination of individual, relational, community, and societal factors contribute to the risk of becoming a perpetrator of SV. Understanding these multilevel factors can help identify various opportunities for prevention.

Risk Factors for Perpetration

Individual Risk Factors

- Alcohol and drug use
- Coercive sexual fantasies
- Impulsive and antisocial tendencies
- Preference for impersonal sex
- Hostility towards women
- Hypermasculinity
- Childhood history of sexual and physical abuse
- Witnessed family violence as a child

Relationship Factors

- Association with sexually aggressive and delinquent peers
- Family environment characterized by physical violence and few resources
- Strong patriarchal relationship or familial environment
- Emotionally unsupportive familial environment

Community Factors

- Lack of employment opportunities
- Lack of institutional support from police and judicial system
- General tolerance of sexual violence within the community
- Weak community sanctions against sexual violence perpetrators

Societal Factors

- Poverty
- Societal norms that support sexual violence
- Societal norms that support male superiority and sexual entitlement
- Societal norms that maintain women's inferiority and sexual submissiveness
- Weak laws and policies related to gender equity
- High tolerance levels of crime and other forms of violence

Sexual Violence: Prevention Strategies

Sexual violence is a serious problem that can have lasting, harmful effects on victims and their family, friends, and communities. The goal of sexual violence prevention is simple—to stop it from happening in the first place. However, the solutions are just as complex as the problem.

Prevention efforts should ultimately decrease the number of individuals who perpetrate sexual violence and the number of individuals who are sexual violence victims. Many prevention approaches aim to reduce risk factors and promote protective factors for sexual violence. In addition, comprehensive prevention strategies should address factors at each of the levels that influence sexual violence—the individual, relationship, community, and society.

The most common prevention strategies currently focus on the victim, the perpetrator, or bystanders.

- Strategies that aim to equip the victim with knowledge, awareness, or self-defense skills are referred to as risk reduction techniques.
- Strategies targeting the perpetrator attempt to change risk and protective factors for sexual violence in order to reduce the likelihood that an individual will engage in sexually violent behavior.
- The goal of bystander prevention strategies is to change social norms supporting sexual violence and empower men and women to intervene with peers to prevent an assault from occurring.
- Other prevention strategies may target social norms, policies, or laws in communities to reduce the perpetration of sexual violence across the population.

Effective and Promising Programs

Unfortunately, little is known about what works to prevent sexual violence. To date, only one prevention program, Safe Dates, has been shown in a randomized controlled trial to prevent or interrupt sexual violence perpetration. Other programs are accumulating evidence for effectiveness and are moving towards or are currently conducting rigorous evaluations. Until more is known about what works and for whom, program planners can use prevention principles to strengthen their approach and evaluation to determine the effectiveness of new or existing programs.

4.8 Intimate Partner Violence



Figure 1. Couple

Intimate partner violence (IPV) is a serious, preventable public health problem that affects millions of Americans. The term “intimate partner violence” describes physical, sexual, or psychological harm by a current or former partner or spouse. This type of violence can occur among heterosexual or same-sex couples and does not require sexual intimacy.

The goal is to stop IPV before it begins. There is a lot to learn about how to prevent IPV. We do know that strategies that promote healthy behaviors in relationships are important. Programs that teach young people skills for dating can prevent violence. These programs

can stop violence in dating relationships before it occurs. IPV can vary in frequency and severity. It occurs on a continuum, ranging from one episode that might or might not have lasting impact to chronic and severe episodes over a period of years. There are four main types of IPV:

- **Physical violence** is the intentional use of physical force with the potential for causing death, disability, injury, or harm. Physical violence includes, but is not limited to, scratching; pushing; shoving; throwing; grabbing; biting; choking; shaking; aggressive hair pulling; slapping; punching; hitting; burning; use of a weapon; and use of restraints or one's body, size, or strength against another person. Physical violence also includes coercing other people to commit any of the above acts.
- **Sexual violence** is divided into five categories. Any of these acts constitute sexual violence, whether attempted or completed. Additionally all of these acts occur without the victim's freely given consent, including cases in which the victim is unable to consent due to being too intoxicated (e.g., incapacitation, lack of consciousness, or lack of awareness) through their voluntary or involuntary use of alcohol or drugs.

Rape or penetration of victim – This includes completed or attempted, forced or alcohol/drug-facilitated unwanted vaginal, oral, or anal insertion. Forced penetration occurs through the perpetrator's use of physical force against the victim or threats to physically harm the victim.

Victim was made to penetrate someone else – This includes completed or attempted, forced or alcohol/drug-facilitated incidents when the victim was made to sexually penetrate a perpetrator or someone else without the victim's consent.

Non-physically pressured unwanted penetration – This includes incidents in which the victim was pressured verbally or through intimidation or misuse of authority to consent or acquiesce to being penetrated.

Unwanted sexual contact – This includes intentional touching of the victim or making the victim touch the perpetrator, either directly or through the clothing, on the genitalia, anus, groin, breast, inner thigh, or buttocks without the victim's consent

Non-contact unwanted sexual experiences – This includes unwanted sexual events that are not of a physical nature that occur without the victim's consent. Examples include unwanted exposure to sexual situations (e.g., pornography); verbal or behavioral sexual harassment; threats of sexual violence to accomplish some other end; and /or unwanted filming, taking or disseminating photographs of a sexual nature of another person.

- **Stalking** is a pattern of repeated, unwanted, attention and contact that causes fear or concern for one's own safety or the safety of someone else (e.g., family member or friend). Some examples include repeated, unwanted phone calls, emails, or texts; leaving cards, letters, flowers, or other items when the victim does not want them; watching or following from a distance; spying; approaching or showing up in places when the victim does not want to see them; sneaking into the victim's home or car; damaging the victim's personal property; harming or threatening the victim's pet; and making threats to physically harm the victim.

Psychological Aggression is the use of verbal and non-verbal communication with the intent to harm another person mentally or emotionally, and/or to exert control over another person. Psychological aggression can include expressive aggression (e.g., name-calling, humiliating); coercive control (e.g., limiting access to transportation, money, friends, and family; excessive monitoring of whereabouts); threats of physical or sexual violence; control of reproductive or sexual health (e.g., refusal to use birth control; coerced pregnancy termination); exploitation of victim's vulnerability (e.g., immigration status, disability); exploitation of perpetrator's vulnerability; and presenting false information to the victim with the intent of making them doubt their own memory or perception (e.g., mind games).

Risk Factors for Intimate Partner Violence

Persons with certain risk factors are more likely to become perpetrators or victims of intimate partner violence (IPV). Those risk factors contribute to IPV but might not be direct causes. Not everyone who is identified as "at risk" becomes involved in violence.

A combination of individual, relational, community, and societal factors contribute to the risk of becoming an IPV perpetrator or victim. Understanding these multilevel factors can help identify various opportunities for prevention.

Risk Factors for Intimate Partner Violence

Individual Risk Factors

- Low self-esteem
- Low income
- Low academic achievement
- Young age
- Aggressive or delinquent behavior as a youth
- Heavy alcohol and drug use
- Depression
- Anger and hostility
- Antisocial personality traits
- Borderline personality traits
- Prior history of being physically abusive
- Having few friends and being isolated from other people
- Unemployment
- Emotional dependence and insecurity
- Belief in strict gender roles (e.g., male dominance and aggression in relationships)
- Desire for power and control in relationships
- Perpetrating psychological aggression
- Seeing or being a victim of physical or psychological abuse (consistently one of the strongest predictors of perpetration)
- History of experiencing poor parenting as a child
- History of experiencing physical discipline as a child

Relationship Factors

- Marital conflict-fights, tension, and other struggles
- Marital instability-divorces or separations

- Dominance and control of the relationship by one partner over the other
- Economic stress
- Unhealthy family relationships and interactions

Community Factors

- Poverty and associated factors (e.g., overcrowding)
- Low social capital-lack of institutions, relationships, and norms that shape a community's social interactions
- Weak community sanctions against IPV (e.g., unwillingness of neighbors to intervene in situations where they witness violence)

Societal Factors

- Traditional gender norms (e.g., women should stay at home, not enter workforce, and be submissive; men support the family and make the decisions)

Protecting Yourself from Relationship Violence

It can be hard to know if your relationship is headed down the wrong path. While it's not always possible to prevent relationship violence, there are steps you can take to protect yourself.

If you think your partner might be controlling or abusive, it's important to:

- Trust your feelings. If something doesn't seem right, take it seriously.
- Learn the warning signs of someone who might become controlling or violent.
- Get help. Talk to experts in relationship violence.

If your partner is controlling or abusive, it's better to get help now than to wait. Controlling or violent relationships usually get worse over time.

Remember: if your partner hurts you, it's not your fault.

What is relationship violence?

Relationship violence is when one person in a relationship is abusive or controlling toward the other person – especially when they disagree about something.

Relationship violence is sometimes called dating violence, **domestic violence**, or **intimate partner violence**. In some relationships, both partners act in abusive or controlling ways. When many people think about relationship violence, they think about physical violence, like hitting or pushing. But people can also use other methods, like threats or insults, to control their partners.

Relationship violence can include:

- Physical violence, like pushing, hitting, or throwing things
- Sexual violence, like forcing or trying to force someone to do something sexual
- Threats of physical or sexual violence, which may include threatening to hurt another person or a pet
- Emotional abuse, like embarrassing a partner or keeping that person away from family and friends

If you feel controlled by or afraid of your partner – even if you haven't been hurt physically – trust yourself. There are people who can help you figure out what to do next.

How do I know if my relationship might become violent?

Relationship violence can start slowly and be hard to recognize at first. For example, when people first start dating, it's common to want to spend a lot of time together. But spending

less time with other people can also be a sign that your partner is trying to control your time.

Try asking yourself these questions:

- Does my partner respect me?
- Does my partner blame me for everything that goes wrong?
- Does my partner make most of the decisions in our relationship?
- Am I ever afraid to tell my partner something?
- Do I ever feel forced to do things that I don't want to do?
- Have I ever done anything sexual with my partner when I didn't want to?
- Does my partner promise to change and then keep doing the same things?

What if I'm not sure if my relationship is violent?

It's okay if you aren't sure – you can still get help. Domestic violence agencies have counselors who are experts at helping people with questions about their relationships. You don't even have to give your name.

If you have questions about your relationship, call the National Domestic Violence Hotline at 1-800-799-SAFE (1-800-799-7233) or [chat online with a trained advocate.](#)

If you are in danger right now, call 911.

Take Action!

If you think your partner is controlling or abusive, take steps to protect yourself.

Trust your instincts.

You are the expert on your life and relationships. If you think your relationship is unhealthy or you are worried about your safety, trust your gut.

Plan for your safety.

If you are in a relationship with someone who is violent or might become violent, make a plan to keep yourself safe. This is important whether you are planning to leave your partner or not.

Start with a phone call.

If you need help or have questions about your relationship, call the National Domestic Violence Hotline at 1-800-799-SAFE (1-800-799-7233). You'll be able to find a domestic violence agency near you or talk to a counselor over the phone. **If you are in danger right now, call 911.**

What kind of help can I get?

Domestic violence agencies provide:

- Emotional support
- Safety planning
- A safe place to stay in an emergency
- Legal help
- Help with housing

What about cost?

Domestic violence agencies offer free services, like hotlines, counseling, and help finding resources such as housing or lawyers.

Healthy vs. unhealthy relationships

Sometimes a relationship might not be abusive, but it might have some serious problems that make it unhealthy. If you think you might be in an unhealthy relationship, you should be able to talk to your partner about your concerns. If you feel like you can't talk to your partner, try talking to a trusted friend, family member, or counselor. Consider calling a confidential hotline to get the support you need and to explore next steps. If you're afraid to end the relationship, call a hotline for help (1-800-799-SAFE).

Signs of an unhealthy relationship include:

- Focusing all your energy on your partner
- Dropping friends and family or activities you enjoy
- Feeling pressured or controlled a lot
- Having more bad times in the relationship than good
- Feeling sad or scared when with your partner

Signs of a healthy relationship include:

- Having more good times in the relationship than bad
- Having a life outside the relationship, with your own friends and activities
- Making decisions together, with each partner compromising at times
- Dealing with conflicts by talking honestly
- Feeling comfortable and able to be yourself
- Feeling able to take care of yourself
- Feeling like your partner supports you

If you feel confused about your relationship, a mental health professional can help. Remember, you deserve to be treated with respect.

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CHAPTER 5: Gender and Sexuality

By far, sex and gender have been two of the most socially significant factors in the history of the world and the United States. Sex is one's biological classification as male or female, which is biologically determined at the moment the sperm fertilizes the egg. Sex can be precisely defined at the genetic level with females having two X chromosomes (XX), while males possess an XY pairing. The female's eggs contain only an X chromosome, while the male's sperm contains half X and half Y chromosomes. Therefore, the sperm that fertilizes the egg determines whether a person has XX (female) or XY (male) pairing of chromosomes. The main difference between sexes is the reproductive body parts assigned to each (including their functions and corresponding hormones).

Gender is culturally-based and varies in a thousand subtle ways across the many diverse cultures of the world. Gender has been shaped by social norms, politics, religion, philosophy, language, tradition and other cultural forces for many years. Gender identity is our personal internal sense of our own maleness or femaleness. Every society has a slightly different view of what it means to be male/masculine and female/feminine. Masculine traits are those we associate with being male, such as aggressiveness, directness, independence, objectiveness, and leadership. Feminine traits are being talkative, submissive, nurturing, emotional, and illogical. Androgyny is when a person shares both masculine and feminine traits. They fit their behavior to the situation; so an androgynous person might cry at a wedding or funeral, but can also change the tire on a car.

Section 5.1 Sexual Scripts

A script is what actors read or study and what guides their behavior in a certain role. A script is a blueprint for what we "should do" in our roles. Sexual scripts are blueprints and guidelines for what we define as our role in sexual expression, sexual orientation, sexual behaviors, sexual desires, and the sexual component of our self-definition. All of us are sexual beings, yet none of us is exactly identical to another in our sexual definitions and script expectations. Having said that, keep in mind that we are not just born with sexual scripts in place; they are learned. Sexual socialization is the process by which we learn how, when, where, with whom, why, and with which motivations we are sexual beings.

We are all born with drives, which are biological needs that demand our attention and behavioral responses to them. The most powerful drives are circulation, breathing, voiding our urine and other waste, eating, drinking, sleeping, and sexual involvement. Sexual drives are biological urges to participate in sexual activity and in certain sexual roles. Sexual scripts, once learned, will shape how that drive is answered. Sexuality is learned via culture and socialization. There are as many unique sexual scripts as there are people, yet some of these scripts have common themes and can be viewed as a collective pattern or trend in the larger social level.

Many of us learn our sexual scripts in a passive way. In other words, we don't learn from experience, but from a synthesis of concepts, images, ideals, and sometimes

misconceptions. For example, the commonly held belief that men and women are two different creatures, perhaps even from different planets, was a very successful fad in recent years that led an entire generation to believe that men might be from "Mars" while women might be from "Venus."

Today more and more people living in the U.S. have less religious values and more diverse experiences with sexuality. Further, much of the younger generations' focus on sex is on the orgasm. An orgasm is the sexual climax that accompanies sexual intercourse and includes muscle tightening in the genital area, electrical sensations radiating from the genitals, and a surge of a variety of pleasure-producing hormones throughout the body. Many cultures have records of sexual expression and some even have records of sexual pleasure maximization.

Some traditional sexual scripts that have been studied include a number of problematic assumptions. Some of these assumptions include but are not limited to: the man must be in charge, the woman must not enjoy (or let on that she enjoys) the sexual experience, the man is a performer whose skills are proven effective upon arrival of his partner's orgasm, men are sexual while women are not, women can't talk about it and turn to men for sexual interests and direction, and finally sex always leads to a female orgasm (her orgasm being proof of his sexual capacity). Numerous studies have shown that most of these traditional scripts are not realistic, healthy, conducive to open communication, nor negotiation of sexual needs and desires for couples. In sum, rather, these traditional notions can be an undermining influence in a couple's intimacy. Scripts that are more contemporary include these simple ideas:

- 1) Both partners need to learn to take ownership of the couple's sexual experiences.
- 2) Both partners need to learn to communicate openly and honestly about their feelings.
- 3) Both partners need to learn to meet one another's desires, needs, and wishes while making sure that their own needs are being met.

Section 5.2 Genital Development

Many people think of male versus female reproductive and sexual body parts in terms of opposites. In sexual matters, men and women are very much alike from a physiological and biological point of view. We are even alike in our fetal development with our genitals developing from identical tissues, regardless of being male or female. Have you ever wondered why a pregnant woman can't get an accurate ultrasound until the second month to determine the fetus's sex being male or female? In part, technicians want to give the fetus enough time to develop genitals that coincide with the particular sex of the baby. More importantly, the fetus has identical genitals until about the 5th-6th week. That means it would require a DNA test to distinguish which sex the fetus is up until that point.

Sexually, males and females start with identical genital buds that usually form into the male or female reproductive organs. Please note that sexual development is a natural yet

extremely complex process that yields a mostly predictable outcome among newborns. That means most females are born with nearly identical sexual parts. Likewise most males are born with nearly identical parts.

With an XY male genetic configuration, the glans area will develop into the penis. The urethral fold will form the urethral meatus or opening in the penis. The urethral groove and lateral buttress will fold onto itself and fuse into the shaft of the penis with the urethra connecting the bladder to the urethral meatus or opening of the penis. The anal tubercle will form into the anus and external sphincter. The male glands (prostate, cowper's, and seminal vesicles) develop in another process as do the testicles, which develop inside the abdomen then drop into the scrotum.

For the XX female genetic configuration, the glans becomes the clitoral glans; the urethral fold becomes the urethral meatus; the urethral groove and lateral buttress become the labia minora and majora (labia means lips); and the anal tubercle becomes the anus and external sphincter. The vagina, cervix, ovaries, and uterus form from other tissues.

Interestingly, ovaries develop inside the abdomen. These basic fetal tissues differentiate because of the X or Y. In adult sexual partners these sexual parts function in very similar ways even though their placement and structure differ.

There are some variations when the actual physical sexual development does not follow expected patterns. Hermaphroditism is found among those variations and is reported in two forms. First, true hermaphroditism is an extremely rare condition wherein both reproductive organs of both males and females are in one person's body and functioning to some degree or another (this includes, penis, testicles, prostate gland, vagina, uterus, and ovaries). Second, pseudohermaphroditism (false or near Hermaphroditism) is a rare condition wherein some of both reproductive organs for males or females are present in one person's body, but neither male nor female organs are completely present and/or fully functioning.

As is mentioned earlier, not all fetal sexual development occurs uniformly. Though not discussed here in great detail, there are five common sexual development variations reported among newborns: Turner's syndrome, Klinefelter's Syndrome; Androgen Insensitivity Syndrome; Fetally Androgenized Females; and DHT-deficient Males. In most cases of fetal development, sexual development is predictable and follows the above mentioned pattern of originating from nearly identical tissues.

Section 5.3 The Importance of Sexuality

Sexuality is important to us because it represents an activity that is a rite of passage into adulthood, because it is very pleasurable, and because it reinforces our roles and aspirations as males and females. Yet sexuality is truly a passive part of our daily lives. Samuel and Cynthia Janus published The Janus Report on Sexual Behavior in 1993. They studied a scientific sample of 2,765 men and women and reported some general trends in U.S. sexual practices and patterns. They found that age-based estimates indicate a great

deal of similarity in sexual frequency between age groups with 2-3 sexual encounters per week.

Sex is a minor (yet important) part of our daily time allocation. People with a sexual partner available have sex about 3 times per week, taking about 25 minutes per experience. That means about 75 minutes per week or 3,900 minutes per year is spent having sex. Divide 3,900 by 60 minutes, and it equals about 65 hours per year having sex. At first glance that sounds like a great deal of time allocation, but keep in mind that in comparison, most of us spend most of our lives doing nonsexual things.

Consider these estimates: if the average person sleeps about eight hours in a 24 hour period, works 8.5 hours, eats 1.5 hours, commutes .5 hour, watches TV for three hours, and spends about 2.5 hours for miscellaneous activities, then compared to routine non-sexual activities, sexual intercourse comprises a relatively small portion of our time.

Relatively speaking sexual intercourse is a passive part of the average person's life accounting for only 65 yearly hours of involvement per year. Many people refrain from regular sexual intercourse until their twenties and are less likely to participate in it if they are not married than are married people. These estimations don't take into account those with no sexual partner and those who abstain from sexual intercourse. The average would be much lower if those categories of people were averaged into the equation.

Section 5.4 Sexual Anatomy

To understand our own bodies and also understand enough about sexuality to teach our children, we must understand the basics of female and male anatomy. Figure 3 shows an artist's depiction of a cross section of female reproductive and sexual anatomy. The clitoris is extremely sensitive and is protected by the clitoral hood (not shown here). It sits above the vagina. In females, urine exits the body at the external urethral orifice (also called meatus). The vaginal orifice simply means the opening to the vagina itself. The labia are in two places, closer to the vaginal orifice (labia minora) and further away from the vaginal orifice (labia majora).

The urinary bladder sits behind the pubic bone and during urination travels an inch or two out of the body via the external urethral orifice. In the back and top of the vagina sits the cervix. The cervix is simply the window into the uterus. It is round, muscular and thick and has a small opening in it. The cervix is the bottom portion of the uterus (the uterus is where a fetus or baby would grow and develop during pregnancy).

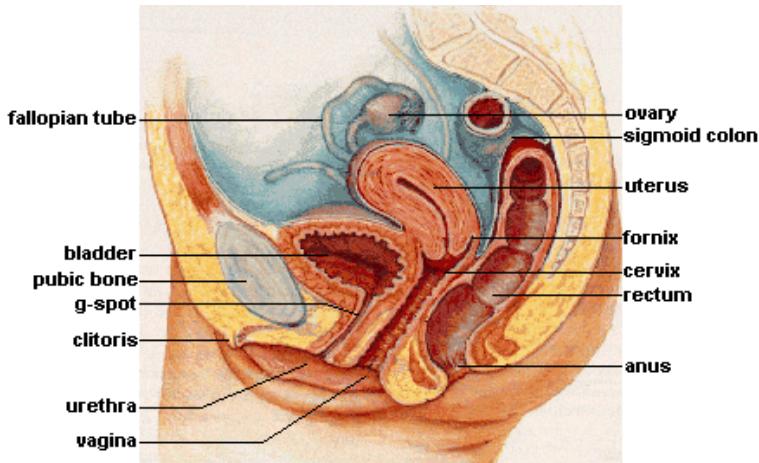


Figure 1. Diagram of a Woman's reproductive Organs

The uterus leans forward toward the pubic bone. Inside the uterus on the left and the right sides are two small openings where the fallopian tube connects the ovaries to the uterus. There are two ovaries that have thousands of eggs in them at birth. A woman may release as many as 450 eggs during her reproductive years. After an egg is released from the ovary (ovulation), the fallopian tube carries the egg from the ovary down to the uterus. When pregnancy occurs it is often because sperm met the egg in the fallopian tube and fertilized it. Later, if the fertilized egg travels down the fallopian tube and implants into the uterus, then conception has taken place.

The vagina is approximately three inches long and is made of tissues that are epithelial and mucosal. This means that when blood flow increases to the pelvis the vagina produces a lubricant in the form of moisture. The vagina is not hollow in the sense that a tube is round and hollow. The vagina is relatively flat and has potential space rather than constantly open space. The vagina has a band of pelvic floor muscles that surround it. One set of muscles is called the puboccocygeus muscle (PC muscle) which is located approximately 1 inch inside the vagina and which also plays a role in sexual pleasure for both partners.

Section 5.5 The Sexual Response

To truly understand how these parts function during sexual intercourse, we need to consider a research-based paradigm developed by Masters and Johnson years ago which they called the sexual response cycle. The sexual response cycle is a model that explains how most people experience three phases when they engage in sexual intercourse: excitement, plateau, and then orgasm.

Masters and Johnson are quick to point out that each individual has a unique and varied sexual response so much so that no two sexual encounters would be expected to be

perfectly identical between the same people. Nevertheless, these three phases are very common among most people.

As sexual intercourse begins both males and females pass through three phases. Excitement phase is when blood flows to the pelvis bringing more lymphatic fluid and plasma to the region. Because of hormonal and psychological stimuli there is generally swelling in the sexual parts. While this is happening, the plateau phase begins which is when more hormones are released, moisture increases, heart rate increases, intensity of sensory perception increases (touch, smell, sight, hearing, and taste). In the orgasm phase an electrical build up of energy is released that is associated with a rhythmic contraction of the pelvic floor muscles, the urinary and anal sphincters, and of various glands for males. This is called an orgasm. After the orgasm finishes, resolution eventually allows the sexual parts to return to pre-excitement conditions. These are almost identical in every way between males and females, except that there are differing sexual parts for each.

Thus, a sexual response in a typical female would typically follow a pattern similar to this one.

In the excitement phase, blood and lymphatic fluids increase swelling inside the vagina. Hormones are secreted which lead to a mild uterine contractions which raise the uterus away from the pubic bone. The labia swell and the clitoris becomes hard. The vaginal tissues secrete moisture and the vagina itself lengthens and expands slightly inward. The plateau phase begins as excitement continues. This causes the labia to become fully swollen, the clitoris to recede under the clitoral hood, and the uterus to become fully elevated (the hormone is called Oxytocin). The vagina is fully lengthened into the body, and, just before orgasm, lubrication ceases. During orgasm, the pelvis of the female experiences a series of contractions which occur every 8/10ths of second and can number anywhere from 1-20 or more in the sequence. The contractions include anal and urinary sphincter contractions, the smooth muscles in the inward portion of the vagina contraction, the pubococcygeus muscle contraction, the uterine contractions which cause the uterus and cervix to dip down into the vagina, and general muscles contractions in the body.

Further, an electrical sensation surges from the clitoris radiating throughout the body and stimulates the pleasure centers of the brain and a release of the hormone called Oxytocin. When the orgasm ends, the body eventually returns to its pre-excitement state. In general, females have more capacity to experience more contractions over a longer period of time than do males.

Females have been found to have much more capacity for sexual intercourse than males. This means females can have more sexual intercourse, more often, and with more orgasms than can the average male.

The male anatomy is presented in Figure 4. The male has a penis which is comprised of 3 spongy-like tissue columns that engorges with blood during excitement. A cross-section of the penis shows two outer columns and one column on the underneath side. The average male penis is just that—average. About 4-6 inches reported by Masters and Johnson. Since the vagina is 3 inches in length and has very sensitive regions near the outside of the vagina

and not so sensitive regions deeper inside, the average male can satisfy the average female in heterosexual intercourse. Urine passes from the urinary bladder and exits at the external urethral orifice at the tip of the penis. The penis is attached inside the body to the pubic bone.

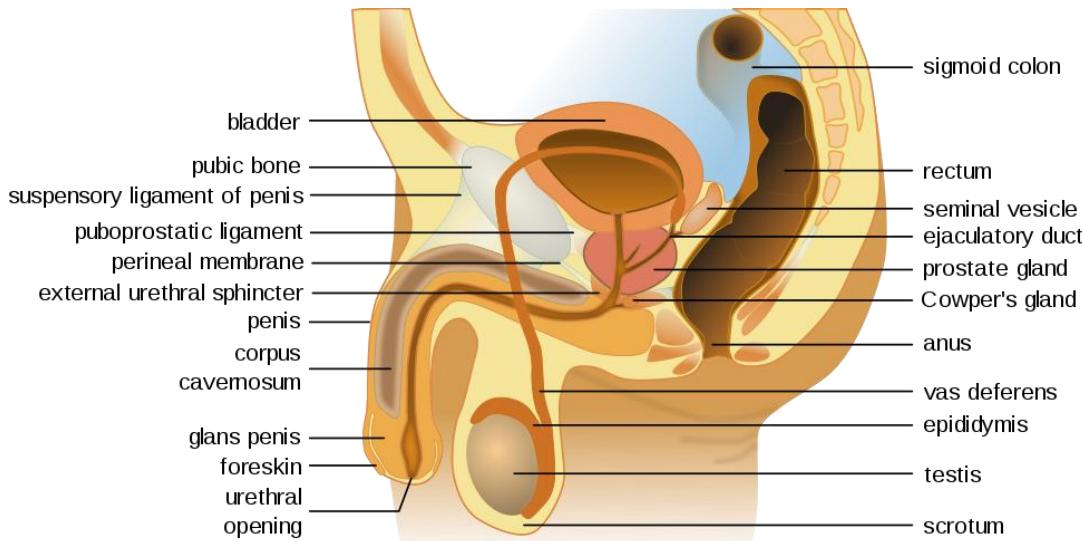


Figure 2. Male Reproductive and Sexual Anatomy, Cross-sectional View

There are two testicles inside a pouch called the scrotum. One testicle sits higher than the other. On the back of the testicle is a storage compartment where mature sperm end up before ejaculation. This is called the epididymis. There is a muscle called the dartos muscle (not shown) which elevates and lowers the testicle based on temperature and sexual pleasure. Sperm grow best at about 91 degrees Fahrenheit and most males are at about 98 degrees, so the dartos will raise and lower the testicles if in colder or warmer temperatures.

The testicles produce about 125-250,000,000 sperm every 3-4 days. More importantly, the testicles produce the sex-drive hormone called Testosterone. In males and females, higher levels of testosterone typically mean a higher sex drive (another similarity). The vas deferens will eventually carry the sperm from the epididymis out of the body during the orgasm. The prostate gland swells during excitement and fills with prostatic fluid. The seminal vesicle located above the prostate gland also swells and produces a fluid filled with natural sugars.

For males, in the excitement phase, blood and lymphatic fluids increase swelling inside the prostate, seminal vesicle, testicle, scrotum, and the penis. Hormones are secreted which lead to a higher volume of blood flowing into the spongy tissue columns of the penis than flow out. The penis erects this way (sometimes the penis will leak fluid and/or sperm before the orgasm, regularly referred to as pre-ejaculate or "pre-cum"). The scrotum and

dartos muscle draw both testicles up toward the pubic bone pressing the epididymis upward. As stimulation continues the swelling and fluid production continues to increase.

The plateau continues until just before the orgasm. When orgasm begins for males the penis is most erect. Males reach a point of no return in their orgasms (females do not). The ejaculation of sperm and fluids will continue in males, regardless of continued or interrupted stimulation.

Females would experience an interruption of the orgasm when stimulation is interrupted. For males, the orgasm also includes a series of contractions which occur every 8/10ths of second and can number anywhere from 1-10. Most males will have 5-6.

The contraction includes: anal and urinary sphincter contractions; prostate and seminal vesicle contractions, dartos and scrotum contractions, pelvic floor muscle contractions; penile contractions; and a rhythmic sequence of these in such a way that the ejaculate is expelled from the body out through the penis. The sperm are released from the epididymis and travel through the vas deferens up and around the bladder then through the ejaculatory duct (where it picks up prostate and seminal fluids) and finally out of the penis. An electrical sensation surges from the prostate gland throughout the body and stimulates the pleasure centers of the brain and a release of the hormone called Oxytocin. For males and females Oxytocin brings a feeling of emotional connection.

After an orgasm, males may continue to experience an erection, but will have to wait a while for the central nervous system to reset before they can ejaculate or orgasm again. Most males wait less time when younger and more time when older. For males, an ejaculation during orgasm would be expected, but sometimes ejaculations happen with or without orgasms, and orgasms may happen without ejaculations.

Section 5.6 The Sexual Experience

Even though the physiological component of sexuality is common between males and females, the male and female sex drives are NOT identical. Studies consistently show that sexual desire for women is more sensitive to the context (meaningful or intimate connection) and the social and cultural environment (quality of relationships, stresses of the day, etc.). Generally speaking most men seek more sex than most women throughout most of the life span. Also, most men are more easily aroused by visual stimulation than are most women.

The Janus Report reported that 65% of men have an orgasm every time during love-making while females reported a much lower 15% every time. About 46% of women report "often" having an orgasm during love-making, compared to only 28% of men. These sex drive differences also emerged in self-reported masturbation frequencies. About 55% of men and 38% of women masturbate on a daily-monthly basis.

When filling out official documents, you are often asked to provide your name, birth date, and sex or gender. But have you ever been asked to provide your sex *and* your gender? It may not have occurred to you that *sex and gender* are not the same. However, sociologists and most other social scientists view sex and gender as conceptually distinct. *Sex* denotes biological characteristics and exists along a spectrum from male to female. *Gender*, on the other hand, denotes social and cultural characteristics that are assigned to different sexes. Sex and gender are not always synchronous, meaning they do not always line up in an easy-to-categorize way.

Section 5.7 Sex and Gender

"Sex" refers to physiological differences found among male, female, and various intersex bodies. Sex includes both *primary sex characteristics* (those related to the reproductive system) and *secondary sex characteristics* (those that are not directly related to the reproductive system, such as breasts and facial hair). In humans, the biological sex of a child is determined at birth based on several factors, including chromosomes, gonads, hormones, internal reproductive anatomy, and genitalia. Biological sex has traditionally been conceptualized as a binary in Western medicine, typically divided into male and female. However, anywhere from 1.0 to 1.7% of children are born intersex, having a variation in sex characteristics (including chromosomes, gonads, or genitals) that do not allow them to be distinctly identified as male or female. Due to the existence of multiple forms of intersex conditions (which are more prevalent than researchers once thought), many view sex as existing along a spectrum, rather than simply two mutually exclusive categories.

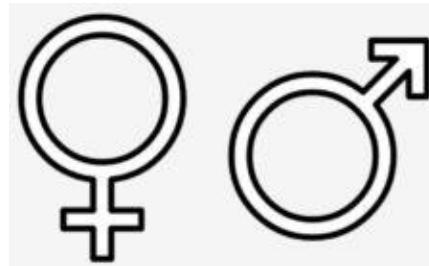


Figure 3. Female and Male Sex Symbols

Male, Female, and the spectrum of sex

In humans, sex is typically divided into male, female, or intersex (i.e., having some combination of male and female sex characteristics). The symbols (to the left) represent female on the left and male on the right.

Gender

A person's sex, as determined by his or her biology, does not always correspond with their gender; therefore, the terms "sex" and "gender" are not interchangeable. "Gender" is a term that refers to social or cultural distinctions associated with being male, female, or intersex. Typically, babies born with male sex characteristics (*sex*) are assigned as boys (*gender*); babies born with female sex characteristics (*sex*) are assigned as girls (*gender*). Because our society operates in a binary system when it comes to gender (in other words, seeing gender as only having two options), many children who are born intersex are forcibly assigned as either a boy or a girl and even surgically "corrected" to fit a particular gender. Scholars generally regard gender as a *social construct*—meaning that it does not exist naturally, but is instead a concept that is created by cultural and societal norms.

Gender identity is a person's sense of self as a member of a particular gender. Individuals who identify with a role that corresponds to the sex assigned to them at birth (for example, they were born with male sex characteristics, were assigned as a boy, and identify today as a boy or man) are cisgender. Those who identify with a role that is *different* from their biological sex (for example, they were born with male sex characteristics, were assigned as a boy, but identify today as a girl, woman, or some other gender altogether) are often referred to as transgender. The term "transgender" encompasses a wide range of possible identities, including agender, genderfluid, genderqueer, two-spirit (for many indigenous people), androgynous, and many others.

The continuum of sex and gender

Those who identify with a gender that is *different* from their biological sex are referred to as transgender.



Figure 4. The Transgender Sex Symbol

Modern scholars such as Anne Fausto-Sterling and Bonnie Spanier criticize the standard binaries of sex and gender, arguing that sex and gender are both fluid concepts that exist along a spectrum, rather than as binaries.

Cultural Variations of Gender

Since the term "sex" refers to biological or physical distinctions, characteristics of sex will not vary significantly between different human societies. For example, persons of the

female sex, in general, regardless of culture, will eventually menstruate and develop breasts that can lactate. Characteristics of gender, on the other hand, may vary greatly between different societies. For example, in American culture, it is considered feminine (or a trait of the female gender) to wear a dress or skirt. However, in many Middle Eastern, Asian, and African cultures, dresses or skirts (often referred to as sarongs, robes, or gowns) can be considered masculine. Similarly, the kilt worn by a Scottish male does not make him appear feminine in his culture.

Section 5.6 Sexuality

Numerous studies show that men and women enjoy sex most in a meaningful relationship, typically long-term committed ones. These studies indicate that the pleasure is more meaningful and enjoyable in long-term committed relationships. Those who abstain from all sexual activity are in the lower left corner with no intimacy and no pleasure. Those who solo masturbate (by themselves) derive pleasure without intimacy. Those who purchase prostitution services derive pleasure, yet have very little intimacy. Finally, those who have one-time sexual encounters in a “one-night stand” also derive pleasure with little intimacy over time.

For married or cohabiting couples, sexual intercourse includes both pleasure and intimacy. Newlyweds typically have their honeymoon night, and sex becomes a rite of passage that marks the beginning of their full emersion into the marital relationship. Sometimes one spouse has sex to meet the needs or wants of their partners. At other times sex is a healthy and fun stress relief. Sometimes sex is a convenient way to be affectionate as a giver and a receiver. In relationships, sexual intercourse has many functions including reinforcing commitment and loyalty with one another. To give and receive is pleasurable and bonding during sexual intercourse.

Some couples seeking parenthood will have sex to pleasure themselves while getting pregnant. Many report enhancements of intimacy with less focus on pleasure at moments such as these. Others get distracted because sex becomes goal-oriented rather than simply expressive while trying to make a baby. For long-term relationships that have endured challenges such as hardship, betrayals, offenses, anger, arguments and ultimately forgiveness, sexual intercourse takes on a profoundness of its own. Those who have short-term relationships miss out on the intimacy payoff that sex provides to those in long-term relationships. Sex becomes a unique way of enhancing trust and closeness while sometimes providing sexual healing to wounded egos and feelings.

Extramarital affairs are intimate relationships with a person other than one's spouse that may be sexual or nonsexual. Most U.S. extramarital affairs are sexual and non-consented to by one's spouse. In spite of a variety of estimates on how many married people were ever unfaithful to their spouse, all scientific studies have found that men were more likely than women to have an extramarital affair and that most men and women do NOT ever have an affair.

Marital infidelity has been and continues to be disapproved of by the general public. Many in the U.S. who disapprove of affairs, simultaneously understand the frailties of the human experience and sympathize to some degree with those who make this “mistake.” Such was found to be true with politicians, movie and TV stars, and sports celebrities (you can pick any one from the online list available on the Internet when you search “celebrity affairs”). Affairs don’t always lead to marital or relational dissolution, but in most cases it is better if the offending spouse or partner confesses the infidelity rather than simply gets caught.

Sexual Identity and Orientation

Human beings are socialized into their adult roles and learn their sexual identities along with their gender roles, work roles, and family roles. Sexual orientation is the sexual preference one has for their partner: male, female, both, or neither. There are a few common sexual orientations that can be seen at the societal and personal level.

Heterosexuality is the sexual attraction between a male and a female. Homosexuality is a sexual attraction between a male to another male or a female to another female. Bisexuality is a sexual attraction to both male and female sexual partners.

There is a difference in these three dimensions of sexuality: sexual orientation, sexual desire, and sexual behaviors. Sexual desire is the attractions we have for sexual partners and experience that exist independent of our behaviors. Sexual behaviors are our actual sexual actions and interactions. It is important to note that orientations, desires, and behaviors are not always the same thing. They do overlap at times. For example, a heterosexual male may have had a homosexual experience in the past, or not. He may at times desire males and females regardless of his actual sexual activities. A lesbian female may have had a short-term heterosexual relationship, yet define herself as a lesbian.

Edward O. Laumann et al. wrote the largest sociological study of U.S. sexuality ever published. In this book he wrote about the prevalence of self-identified sexual orientations. Laumann and the other researchers surveyed about 3,400 respondents. By far, most members of U.S. society are heterosexual. Laumann avoided the use of the words “heterosexual” or “homosexual.” He found that 7.1% of males and 3.8% of females have had sex with a partner of the same sex. Laumann also reported that over 96% of males and 98% of females identified themselves as heterosexual. Only two percent of males and 0.9% of females identified themselves as homosexual, while 0.8% of males and 0.5% of females reported bisexuality.

The Janus Report also reported their findings on sexual behaviors and sexual orientation. Their sample reported 22% of men and 17% of women said yes to the question, “Have you had a homosexual experience?” Janus also reported that 91% of men and 95% of women claimed to be heterosexual; four percent of men and two percent of women claimed to be homosexual; and five percent of men and three percent of women claimed to be bisexual. Heterosexuality is by far the most common identification in studies where respondents are asked to identify their sexual orientation. Yet, heterosexuals may have had a variety of sexual experiences in a variety of context and still consider themselves to be heterosexual.

in spite of dimensional discontinuity or continuity. Generally speaking Janus and Laumann found that the U.S. is a very sexual nation. They reported that very few men and women reported never having had vaginal sexual intercourse (less than five percent). They reported that men typically have sex sooner than women and that most had sex by age 20. Janus specifically reported that only nine percent of men and 17% of women had NO sexual experience before marriage.

Sexuality and Politics

Sexual orientation, desires, and behaviors have become extremely politicized. The largest sexual political action committee is the Human Rights Campaign, which emerged in the 1980s as a Gay Community Rights organization. LGBT and LGBTQ have replaced Gay Community as the collective acronym. LGBT stands for Lesbian, Gay, Bisexual, and Transgender (occasionally Queer is added by some interest groups). The Human Rights Campaign has become the central political action organization for LGBTQ interest groups. Marriage between same-sex couples became an emotionally charged political issue during the California Proposition 8 referendum and constitutional amendment that Passed November 2008.

Because it passed, the California Section 7.5 of the Declaration of Rights to the State Constitution read, "Only marriage between a man and a woman is valid or recognized in California." This set a strong national precedence against rights to same-sex couples to have legally recognized marriage on par with heterosexual married couples. Estimates are that over \$80 million was spent on this proposition alone on both the for and against efforts.

The Prop 8 initiative originated from a political action committee called ProtectMarriage.com. It self-describes as a "...broad-based coalition of California families, community leaders, religious leaders, pro-family organizations and individuals...to restore the definition of marriage as between a man and a woman." Proposition 8 was ultimately ruled unconstitutional by a federal court in 2010, although the court decision did not go into effect until June 26, 2013, following the conclusion of proponents' appeals.

In the past same-sex marriage in the United States was established on a state-by-state basis, expanding from 1 state in 2004 to 36 states in 2015, when, on June 26, 2015, same-sex marriage was established in all 50 states as a result of the ruling of the Supreme Court of the United States in the landmark civil rights case *Obergefell v. Hodges*, in which it was held that the right of same-sex couples to marry on the same terms and conditions as opposite-sex couples, with all the accompanying rights and responsibilities, was guaranteed by both the Due Process Clause and the Equal Protection Clause of the Fourteenth Amendment to the United States Constitution.

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CHAPTER 6: Sexual Health

Section 6.1 Sexual Health

Sexual health is a state of physical, emotional, mental and social well-being in relation to sexuality; it is not merely the absence of disease, dysfunction or infirmity. Sexual health requires a positive and respectful approach to sexuality and sexual relationships, as well as the possibility of having pleasurable and safe sexual experiences, free of coercion, discrimination and violence.

Section 6.2 Sexuality

Sexuality is a major part of being human. Love, affection and sexual intimacy all play a role in healthy relationships. They also contribute to your sense of well-being. A number of disorders can affect the ability to have or enjoy sex in both men and women. Concerns about infertility or fear of unplanned pregnancy can also come into play. In addition, a number of diseases and disorders affect sexual health. These include sexually transmitted diseases and cancer. In men, treatment of prostate cancer can cause erectile dysfunction. In women, cervical, uterine, vaginal, vulvar or ovarian cancer may have sexual effects.

Section 6.3 Public Health Approach to Sexual Health

Sexuality affects individuals and society across a broad spectrum of activities: through health, but also through factors at multiple levels, such as gender relations, reproduction, and economics. Physiological, behavioral, and affective measurement of sexuality and sexual behavior is complicated by cultural values and norms, but is essential to individual health (including happiness) as well as public health.

Section 6.4 Stigma

Cultural or structural norms that stigmatize aspects of sexuality, such as sexual orientation, have adverse effects on individuals across their lifespan, with homophobia being a prominent example of such. In addition, survey data reveal several individual and relationship factors that are important to sexual health at all levels, with overall health noted as the greatest predictor of sexual satisfaction.

Section 6.5 Sexual Dysfunction

Sexual dysfunction can pose public health problems, as it is related to public health issues and affects people's happiness and general well-being.

According to the National Health and Social Life Survey,

- The prevalence of sexual dysfunction was found to be higher among women than men.

- Lack of sexual desire is the most common problem among women
- For men, the most common sexual problem is premature ejaculation, not erectile dysfunction.
- Sexual problems increase with age, but sex-related personal distress decreases.

Section 6.6 Sexual Frequency

Sexual frequency is important for sexual relationship satisfaction. Sexual intercourse frequency is noted as being the most important factor when predicting sexual satisfaction. Satisfaction declines with age but not as steeply as sexual frequency declines. However, although satisfaction is lower in women, satisfaction levels do not change over time among women, compared with men.

Section 6.7 Sex and Health

Duration and age matter, but health matters most of all. Health proves to be a critical predictor of sexual satisfaction. Among those indicating their health is at least “very good,” more than half say they are satisfied with their sex lives. The majority of older Americans do not practice safe sex, even if they have multiple partners. It was reported that only 1 in 5 sexually active, dating singles use condoms regularly. Many older Americans report dating more than one person at a time and being sexually active with more than one sex partner (6% of men and 1% of women).

Section 6.8 Sexual Happiness

The most important indicator of the sexual happiness of older Americans is having a steady sex partner. That indicator is less important than the frequency of sexual intercourse, good health, low levels of stress, and the absence of financial worries. There are still behavioral differences between older men and women, and older men and women continue to rank the importance of sex and the enjoyment of sex differently—even as they age. Older men continue to have more sex and think about sex more than older women; they see it as more important to their quality of life. Older men report having more frequent orgasms than women (2 out of 3 men, compared with 1 in 3 women), but their frequency of orgasm drops with age. Older men are twice as likely (21% compared with 11%) to admit sexual activity outside their relationship than women.

Section 6.9 Sexual Bias and Misconceptions

People who are lesbian, gay, bisexual, or transgender (LGBT) are members of every community. They are diverse, come from all walks of life, and include people of all races and ethnicities, all ages, all socioeconomic statuses, and from all parts of the country. The perspectives and needs of LGBT people should be routinely considered in public health efforts to improve the overall health of every person and eliminate health disparities.

In addition to considering the needs of LGBT people in programs designed to improve the health of entire communities, there is also a need for culturally competent medical care and prevention services that are specific to this population. Social inequality is often associated with poorer health status, and sexual orientation has been associated with multiple health threats. Members of the LGBT community are at increased risk for a number of health threats when compared to their heterosexual peers. Differences in sexual behavior account for some of these disparities, but others are associated with social and structural inequities, such as the stigma and discrimination that LGBT populations experience.

Section 6.10 Reproductive Health

Both the male and female reproductive systems play a role in pregnancy. Problems with these systems can affect fertility and the ability to have children. There are many such problems in men and women. Reproductive health problems can also be harmful to overall health and impair a person's ability to enjoy a sexual relationship.

Your reproductive health is influenced by many factors. These include your age, lifestyle, habits, genetics, use of medicines and exposure to chemicals in the environment. Many problems of the reproductive system can be corrected.

Reproductive health includes a variety of topics, such as:

- Menstruation and menopause
- Pregnancy and preconception care
- Fertility/Infertility
- Contraception

Menstruation

The menstrual cycle is the process by which a woman's body gets ready for the chance of a pregnancy each month. The average menstrual cycle is 28 days from the start of one to the start of the next, but it can range from 21 days to 35 days.

Most menstrual periods last from three to five days. In the United States, most girls start menstruating at age 12, but girls can start menstruating between the ages of 8 and 16.

Menstruation is a woman's monthly bleeding. When you menstruate, your body sheds the lining of the uterus (womb). Menstrual blood flows from the uterus through the small opening in the cervix and passes out of the body through the vagina (see how the menstrual cycle works below). Most menstrual periods last from 3 to 5 days.

When periods (menstruations) come regularly, this is called the menstrual cycle. Having regular menstrual cycles is a sign that important parts of your body are working normally. The menstrual cycle provides important body chemicals, called hormones, to keep you healthy. It also prepares your body for pregnancy each month. A cycle is counted from the first day of 1 period to the first day of the next period. The average menstrual cycle is 28 days long. Cycles can range anywhere from 21 to 35 days in adults and from 21 to 45 days in young teens.

In the first half of the cycle, levels of estrogen (the female hormone) start to rise. Estrogen plays an important role in keeping you healthy, especially by helping you to build strong bones and to help keep them strong, as you get older. Estrogen also makes the lining of the uterus (womb) grow and thicken. This lining of the womb is a place that will nourish the embryo if a pregnancy occurs. At the same time the lining of the womb is growing, an egg, or ovum, in one of the ovaries starts to mature. At about day 14 of an average 28-day cycle, the egg leaves the ovary. This is called ovulation.

After the egg has left the ovary, it travels through the fallopian tube to the uterus. Hormone levels rise and help prepare the uterine lining for pregnancy. A woman is most likely to get pregnant during the 3 days before or on the day of ovulation. Keep in mind, women with cycles that are shorter or longer than average may ovulate before or after day 14. A woman becomes pregnant if the egg is fertilized by a man's sperm cell and attaches to the uterine wall. If the egg is not fertilized, it will break apart. Then, hormone levels drop, and the thickened lining of the uterus is shed during the menstrual period.

The Menstrual Cycle

- Day 1 starts with the first day of your period. This occurs after hormone levels drop at the end of the previous cycle, signaling blood and tissues lining the uterus (womb) to break down and shed from the body. Bleeding lasts about 5 days.
- Usually by Day 7, bleeding has stopped. Leading up to this time, hormones cause fluid filled pockets called follicles to develop on the ovaries. Each follicle contains an egg.
- Between Day 7 and 14, one follicle will continue to develop and reach maturity. The lining of the uterus starts to thicken, waiting for a fertilized egg to implant there. The lining is rich in blood and nutrients.
- Around Day 14 (in a 28-day cycle), hormones cause the mature follicle to burst and release an egg from the ovary, a process called ovulation.
- Over the next few days, the egg travels down the fallopian tube towards the uterus. If a sperm unites with the egg here, the fertilized egg will continue down the fallopian tube and attach to the lining of the uterus.
- If the egg is not fertilized, hormone levels will drop around Day 25. This signals the next menstrual cycle to begin. The egg will break apart and be shed with the next period.

Pregnancy

Pregnancy is the term used to describe when a woman has a growing fetus inside of her. In most cases, the fetus grows in the uterus. Human pregnancy lasts about 40 weeks, or just more than 9 months, from the start of the last menstrual period to childbirth.

What are prenatal and preconception care and why are they important?

Prenatal care is the care woman gets during a pregnancy. Getting early and regular prenatal care is important for the health of both mother and the developing baby. In addition, health care providers are now recommending a woman see a health care provider for preconception care, even before she considers becoming pregnant or in between pregnancies.

Knowing if you are pregnant

A missed period is often the first clue that a woman might be pregnant. Sometimes, a woman might suspect she is pregnant even sooner. Symptoms such as headache, fatigue, and breast tenderness, can occur even before a missed period. The wait to know can be emotional. These days, many women first use home pregnancy tests (HPT) to find out. Your doctor also can test you.

All pregnancy tests work by detecting a special hormone in the urine or blood that is only there when a woman is pregnant. It is called human chorionic gonadotropin (kohr-ee-ON-ihk goh-NAD-uh-TROH-puhn), or hCG. hCG is made when a fertilized egg implants in the uterus. hCG rapidly builds up in your body with each passing day you are pregnant. Read on to learn when and how to test for pregnancy.

Home pregnancy tests

Reading a home pregnancy test

HPTs are inexpensive, private, and easy to use. Most drugstores sell HPTs over the counter. The cost depends on the brand and how many tests come in the box. They work by detecting hCG in your urine. HPTs are highly accurate. But their accuracy depends on many things. These include:

- **When you use them** – The amount of hCG in your urine increases with time. So, the earlier after a missed period you take the test the harder it is to spot the hCG. Some HPTs claim that they can tell if you are pregnant one day after a missed period or even earlier. But a recent study shows that most HPTs don't give accurate results this early in pregnancy. Positive results are more likely to be true than negative results. Waiting one week after a missed period will usually give a more accurate result. You can take the test sooner. But just know that a lot of pregnant women will get negative test results during the first few days after the missed period. It's a good idea to repeat the test again after a week has passed. If you get two negative results but still think you're pregnant, call your doctor.
- **How you use them** – Be sure to check the expiration date and follow the directions. Many involve holding a test stick in the urine stream. For some, you collect urine in a cup and then dip the test stick into it. Then, depending on the brand, you will wait a few minutes to get the results. Research suggests waiting 10 minutes will give the most accurate result. Also, testing your urine first thing in the morning may boost the accuracy. You will be looking for a plus sign, a change in color, or a line. A

change, whether bold or faint, means the result is positive. New digital tests show the words "pregnant" or "not pregnant". Most tests also have a "control indicator" in the results window. This line or symbol shows whether or not the test is working. If the control indicator does not appear, the test is not working properly. You should not rely on any results from a HPT that may be faulty.

- **Who uses them** – The amount of hCG in the urine is different for every pregnant woman. So, some women will have accurate results on the day of the missed period while others will need to wait longer. Also, some medicines affect HPTs. Discuss the medicines you use with your doctor before trying to become pregnant.
- **The brand of test** – Some HPT tests are better than others at spotting hCG early on.

The most important part of using any HPT is to follow the directions exactly as written. Most tests also have toll-free phone numbers to call in case of questions about use or results.

If a HPT says you are pregnant, you should call your doctor right away. Your doctor can use a more sensitive test along with a pelvic exam to tell for sure if you're pregnant. Seeing your doctor early on in your pregnancy can help you and your baby stay healthy.

Unplanned Pregnancy

Unplanned pregnancy is common. About 1 in 2 pregnancies in America are unplanned. Ideally, a woman who is surprised by an unplanned pregnancy is in good preconception health and is ready and able to care for a new child. But this sometimes isn't the case.

If you have an unplanned pregnancy, you might not know what to do next. You might worry that the father (or mother) won't welcome the news. You might not be sure you can afford to care for a baby. You might worry if past choices you have made, such as drinking or drug use, will affect your unborn baby's health. You might be concerned that having a baby will keep you from finishing school or pursuing a career.

If you are pregnant after being raped, you might feel ashamed, numb, or afraid. Unplanned pregnancy is common among abused women. Research has found that some abusers force their partners to have sex without birth control and/or sabotage the birth control their partners are using, leading to unplanned pregnancy.

You might wonder what options you have. Here are some next steps to help you move forward:

- Start taking care of yourself right away. Take 400 to 800 micrograms (400 to 800 mcg or 0.4 to 0.8 mg) folic acid every. Stop alcohol, tobacco, and drug use.
- Make a doctor's visit to confirm your pregnancy. Discuss your health and issues that could affect your pregnancy. Ask for help quitting smoking. Find out what you can do to take care of yourself and your unborn baby.
- Ask your doctor to recommend a counselor who you can talk to about your situation.
- Seek support in someone you trust and respect.

Trying to Get Pregnant

How do you figure out when you're fertile and when you're not? Wondering if you or your partner is infertile? Read on to boost your chances of conception and get help for fertility problems.

Fertility awareness

The menstrual cycle

Being aware of your menstrual cycle and the changes in your body that happen during this time can help you know when you are most likely to get pregnant.

The average menstrual cycle lasts 28 days. But normal cycles can vary from 21 to 35 days. The amount of time before ovulation occurs is different in every woman and even can be different from month to month in the same woman, varying from 13 to 20 days long. Learning about this part of the cycle is important because it is when ovulation and pregnancy can occur. After ovulation, every woman (unless she has a health problem that affects her periods or becomes pregnant) will have a period within 14 to 16 days.

Charting your fertility pattern

Knowing when you're most fertile will help you plan pregnancy. There are three ways you can keep track of your fertile times. They are:

- 1 **Basal body temperature method** – Basal body temperature is your temperature at rest as soon as you awake in the morning. A woman's basal body temperature rises slightly with ovulation. So by recording this temperature daily for several months, you'll be able to predict your most fertile days.
- 2 Basal body temperature differs slightly from woman to woman. Anywhere from 96 to 98 degrees Fahrenheit orally is average before ovulation. After ovulation most women have an oral temperature between 97 and 99 degrees Fahrenheit. The rise in temperature can be a sudden jump or a gradual climb over a few days.
- 3 Usually a woman's basal body temperature rises by only 0.4 to 0.8 degrees Fahrenheit. To detect this tiny change, women must use a basal body thermometer. These thermometers are very sensitive. Most pharmacies sell them for about \$10. You can then record your temperature on a basal body temperature chart.
- 4 The rise in temperature doesn't show exactly when the egg is released. But almost all women have ovulated within three days after their temperatures spike. Body temperature stays at the higher level until the woman's period starts.
- 5 A woman is most fertile and most likely to get pregnant:
 - Two to three days before your temperature hits the highest point (ovulation)
 - and
 - 12 to 24 hours after ovulation

- 6 A man's sperm can live for up to three days in a woman's body. The sperm can fertilize an egg at any point during that time. So if you have unprotected sex a few days before ovulation, you could get pregnant.
- 7 Many things can affect basal body temperature. For your chart to be useful, make sure to take your temperature every morning at about the same time. Things that can alter your temperature include:
 - Drinking alcohol the night before
 - Smoking cigarettes the night before
 - Getting a poor night's sleep
 - Having a fever
 - Doing anything in the morning before you take your temperature — including going to the bathroom and talking on the phone
- 8 **Calendar method**– This involves recording your menstrual cycle on a calendar for eight to 12 months. The first day of your period is Day 1. Circle Day 1 on the calendar. The length of your cycle may vary from month to month. So write down the total number of days it lasts each time. Using this record, you can find the days you are most fertile in the months ahead:

To find out the first day when you are most fertile, subtract 18 from the total number of days in your shortest cycle. Take this new number and count ahead that many days from the first day of your next period. Draw an X through this date on your calendar. The X marks the first day you're likely to be fertile.

To find out the last day when you are most fertile, subtract 11 from the total number of days in your longest cycle. Take this new number and count ahead that many days from the first day of your next period. Draw an X through this date on your calendar. The time between the two Xs is your most fertile window.
- 9 This method always should be used along with other fertility awareness methods, especially if your cycles are not always the same length.

Optional: Use this Ovulation and due date calculator to find out when you (or a woman you know) are most likely to become pregnant and to estimate your due date should conception occur.

Did you know?

The cervical mucus method is less reliable for some women. Women who are breastfeeding, taking hormonal birth control (like the pill), using feminine hygiene products, have vaginitis or sexually transmitted infections (STIs), or have had surgery on the cervix should not rely on this method.

1. **Cervical mucus method** (also known as the ovulation method) – This involves being aware of the changes in your cervical mucus throughout the month. The hormones that control the menstrual cycle also change the kind and amount of mucus you have before and during ovulation. Right after your period, there are usually a few days when there is no mucus present or "dry days." As the egg starts to

mature, mucus increases in the vagina, appears at the vaginal opening, and is white or yellow and cloudy and sticky. The greatest amount of mucus appears just before ovulation. During these "wet days" it becomes clear and slippery, like raw egg whites. Sometimes it can be stretched apart. This is when you are most fertile. About four days after the wet days begin the mucus changes again. There will be much less and it becomes sticky and cloudy. You might have a few more dry days before your period returns. Describe changes in your mucus on a calendar. Label the days, "Sticky," "Dry," or "Wet." You are most fertile at the first sign of wetness after your period or a day or two before wetness begins.

2. To most accurately track your fertility, use a combination of all three methods. This is called the symptothermal (SIMP-toh-thur-muhl) method. You can also purchase over-the-counter ovulation kits or fertility monitors to help find the best time to conceive. These kits work by detecting surges in a specific hormone called luteinizing hormone, which triggers ovulation.

Infertility

Some women want children but either cannot conceive or keep miscarrying. This is called *infertility*. Lots of couples have infertility problems. About one-third of the time, it is a female problem. In another one-third of cases, it is the man with the fertility problem. For the remaining one-third, both partners have fertility challenges or no cause is found.

Causes of infertility

Some common reasons for infertility in women include:

Age – Women generally have some decrease in fertility starting in their early 30s. And while many women in their 30s and 40s have no problems getting pregnant, fertility especially declines after age 35. As a woman ages, normal changes that occur in her ovaries and eggs make it harder to become pregnant. Even though menstrual cycles continue to be regular in a woman's 30s and 40s, the eggs that ovulate each month are of poorer quality than those from her 20s. It is harder to get pregnant when the eggs are poorer in quality. As a woman nears menopause, the ovaries may not release an egg each month, which also can make it harder to get pregnant. Also, as a woman and her eggs age, she is more likely to miscarry, as well as have a baby with genetic problems, such as Down syndrome.

Health problems – Some women have diseases or conditions that affect their hormone levels, which can cause infertility. Women with polycystic ovary syndrome (PCOS) rarely or never ovulate. Failure to ovulate is the most common cause of infertility in women.

- With primary ovarian insufficiency (POI), a woman's ovaries stop working normally before she is 40. It is not the same as early menopause. Some women with POI get a period now and then. But getting pregnant is hard for women with POI.
- A condition called luteal phase defect (LPD) is a failure of the uterine lining to be fully prepared for pregnancy. This can keep a fertilized egg from implanting or result in miscarriage.

Common problems with a woman's reproductive organs, like uterine fibroids, endometriosis, and pelvic inflammatory disease can worsen with age and also affect fertility. These conditions might cause the fallopian tubes to be blocked, so the egg can't travel through the tubes into the uterus.

Lifestyle factors – Certain lifestyle factors also can have a negative effect on a woman's fertility. Examples include smoking, alcohol use, weighing much more or much less than an ideal body weight, a lot of strenuous exercise, and having an eating disorder. Stress also can affect fertility.

Unlike women, some men remain fertile into their 60s and 70s. But as men age, they might begin to have problems with the shape and movement of their sperm. They also have a slightly higher risk of sperm gene defects. Or they might produce no sperm, or too few sperm. Lifestyle choices also can affect the number and quality of a man's sperm. Alcohol and drugs can temporarily reduce sperm quality. And researchers are looking at whether environmental toxins, such as pesticides and lead, also may be to blame for some cases of infertility. Men also can have health problems that affect their sexual and reproductive function. These can include sexually transmitted infections (STIs), diabetes, surgery on the prostate gland, or a severe testicle injury or problem.

When to see your doctor

You should talk to your doctor about your fertility if:

* You are younger than 35 and have not been able to conceive after one year of frequent sex without birth control.

- You are age 35 or older and have not been able to conceive after six months of frequent sex without birth control.
- You believe you or your partner might have fertility problems in the future (even before you begin trying to get pregnant).
- You or your partner has a problem with sexual function or libido.

Happily, doctors are able to help many infertile couples go on to have babies.

If you are having fertility issues, your doctor can refer you to a fertility specialist, a doctor who treats infertility. The doctor will need to test both you and your partner to find out what the problem is. Depending on the problem, your doctor might recommend treatment. About 9 in 10 cases of infertility are treated with drugs or surgery. *Don't delay seeing your doctor as age also affects the success rates of these treatments.* For some couples, adoption or foster care offers a way to share their love with a child and to build a family.

Infertility treatment

Some treatments include:

- **Drugs** – Various fertility drugs may be used for women with ovulation problems. It is important to talk with your doctor about the drug to be used. You should understand the drug's benefits and side effects. Depending on the type of fertility drug and the dosage of the drug used, multiple births (such as twins) can occur.
- **Surgery** – Surgery is done to repair damage to a woman's ovaries, fallopian tubes, or uterus. Sometimes a man has an infertility problem that can be corrected by surgery.
- **Intrauterine (in-truh-YOOT-uh-ruhn) insemination (IUI), also called artificial insemination** – Male sperm is injected into part of the woman's reproductive tract, such as into the uterus or fallopian tube. IUI often is used along with drugs that cause a woman to ovulate.
- **Assisted reproductive technology (ART)** – ART involves stimulating a woman's ovaries; removing eggs from her body; mixing them with sperm in the laboratory; and putting the embryos back into a woman's body. Success rates of ART vary and depend on many factors.
- **Third party assistance** – Options include donor eggs (eggs from another woman are used), donor sperm (sperm from another man are used), or surrogacy (when another woman carries a baby for you).

Finding the cause of infertility is often a long, complex, and emotional process. And treatment can be expensive. Many health insurance companies do not provide coverage for infertility or provide only limited coverage. Check your health insurance contract carefully to learn about what is covered. Some states have laws that mandate health insurance policies to provide infertility coverage.

Preconception Care: Why Preconception Health Matters

Preconception health is a woman's health before she becomes pregnant. It means knowing how health conditions and risk factors could affect a woman or her unborn baby if she becomes pregnant. For example, some foods, habits, and medicines can harm your baby — even before he or she is conceived. Some health problems, such as diabetes, also can affect pregnancy.

Every woman should be thinking about her health whether or not she is planning pregnancy. One reason is that about half of all pregnancies are not planned. Unplanned pregnancies are at greater risk of preterm birth and low birth weight babies. Another reason is that, despite important advances in medicine and prenatal care, about 1 in 8 babies is born too early. Researchers are trying to find out why and how to prevent preterm birth. But experts agree that women need to be healthy before becoming pregnant. By taking action on health issues and risks before pregnancy, you can prevent problems that might affect you or your baby later.

Five most important things to boost your preconception health

Women and men should prepare for pregnancy before becoming sexually active — or at least three months before getting pregnant. Some actions, such as quitting smoking, reaching a healthy weight, or adjusting medicines you are using, should start even earlier. The five most important things a woman can do for preconception health are:

- 1 Take 400 to 800 micrograms (400 to 800 mcg or 0.4 to 0.8 mg) of folic acid every day if you are planning or capable of pregnancy to lower your risk of some birth defects of the brain and spine, including spina bifida. All women need folic acid every day. Talk to your doctor about your folic acid needs. Some doctors prescribe prenatal vitamins that contain higher amounts of folic acid.
- 2 Stop smoking and drinking alcohol.
- 3 If you have a medical condition, be sure it is under control. Some conditions that can affect pregnancy or be affected by it include asthma, diabetes, oral health, obesity, or epilepsy.
- 4 Talk to your doctor about any over-the-counter and prescription medicines you are using. These include dietary or herbal supplements. Be sure your vaccinations are up to date.
- 5 Avoid contact with toxic substances or materials that could cause infection at work and at home. Stay away from chemicals and cat or rodent feces.

Contraception

According to the Guttmacher Institute: " In 2008, there were 6.4 million pregnancies to the 62 million women of reproductive age (15–44) in the United States. Sixty-six percent of these pregnancies resulted in live births and 19% in induced abortions. And, nearly half of pregnancies among American women—more than three million each year—are unintended."

An unintended pregnancy is a pregnancy that is either mistimed or unwanted at the time of conception. It is a core concept in understanding the fertility of populations and the unmet need for contraception. Unintended pregnancy is associated with an increased risk of morbidity for women, and with health behaviors during pregnancy that are associated with adverse effects. For example, women with an unintended pregnancy may delay prenatal care, which may affect the health of the infant. Women of all ages may have unintended pregnancies, but some groups, such as teens, are at a higher risk.

Efforts to decrease unintended pregnancy include finding better forms of contraception, and increasing contraceptive use and adherence.

Contraception, also known as birth control, is designed to prevent pregnancy. Some types of birth control include (but are not limited to):

- Barrier methods, such as condoms, the diaphragm, and the cervical cap, are designed to prevent the sperm from reaching the egg for fertilization. Intrauterine device, or IUD, is a small device that is inserted into the uterus by a health care provider. The

IUD prevents a fertilized egg from implanting in the uterus. An IUD can stay in the uterus for up to 10 years until a health care provider removes it.

- Hormonal birth control, such as birth control pills, injections, skin patches, and vaginal rings, release hormones into a woman's body that interfere with fertility by preventing ovulation, fertilization, or implantation.
- Sterilization is a method that permanently prevents a woman from getting pregnant or a man from being able to get a woman pregnant. Sterilization involves surgical procedures that must be done by a health care provider and usually cannot be reversed.

The choice of birth control depends on factors such as a person's overall health, age, frequency of sexual activity, number of sexual partners, desire to have children in the future, and family history of certain diseases. A woman should talk to her health care provider about her choice of birth control method.

It is important to remember that even though birth control methods can prevent pregnancy, they do not all protect against sexually transmitted diseases or HIV.

Contraception Methods

There is no "best" method of birth control. Each method has its pros and cons. All women and men can have control over when, and if, they become parents. Making choices about birth control, or contraception, isn't easy. There are many things to think about. To get started, learn about birth control methods you or your partner can use to prevent pregnancy. You can also talk with your doctor about the choices.

Before choosing a birth control method, think about:

- Your overall health
- How often you have sex
- The number of sex partners you have
- If you want to have children someday
- How well each method works to prevent pregnancy
- Possible side effects
- Your comfort level with using the method

You can choose from many methods of birth control. They are grouped by how they work:

- Continuous abstinence: This means not having sex (vaginal, anal, or oral) at any time. It is the only sure way to prevent pregnancy and protect against sexually transmitted infections (STIs), including HIV.
- Natural family planning/rhythm method: This method is when you do not have sex or use a barrier method on the days you are most fertile (most likely to become

pregnant). A woman who has a regular menstrual cycle has about 9 or more days each month when she is able to get pregnant. These fertile days are about 5 days before and 3 days after ovulation, as well as the day of ovulation.

To have success with this method, you need to learn about your menstrual cycle. Then you can learn to predict which days you are fertile or "unsafe." To learn about your cycle, keep a written record of:

- When you get your period
- What it is like (heavy or light blood flow)
- How you feel (sore breasts, cramps)

This method also involves checking your cervical mucus and recording your body temperature each day. Cervical mucus is the discharge from your vagina. You are most fertile when it is clear and slippery like raw egg whites. Use a basal thermometer to take your temperature and record it in a chart. Your temperature will rise 0.4 to 0.8° F on the first day of ovulation. You can talk with your doctor or a natural family planning instructor to learn how to record and understand this information.

Barrier Methods - Put up a block, or barrier, to keep sperm from reaching the egg

Contraceptive Sponge

Before having sex, you wet the sponge and place it, loop side down, inside your vagina to cover the cervix. The sponge is effective for more than one act of intercourse for up to 24 hours. It needs to be left in for at least 6 hours after having sex to prevent pregnancy. It must then be taken out within 30 hours after it is inserted.

Only one kind of contraceptive sponge is sold in the United States. It is called the Today Sponge. Women who are sensitive to the spermicide nonoxynol-9 should not use the sponge.

Diaphragm, cervical cap, and cervical shield

These barrier methods block the sperm from entering the cervix (the opening to your womb) and reaching the egg.

- The diaphragm is a shallow latex cup.
- The cervical cap is a thimble-shaped latex cup. It often is called by its brand name, FemCap.
- The cervical shield is a silicone cup that has a one-way valve that creates suction and helps it fit against the cervix. It often is called by its brand name, Lea's Shield.

The diaphragm and cervical cap come in different sizes, and you need a doctor to "fit" you for one. The cervical shield comes in one size, and you will not need a fitting. Before having sex, add spermicide (to block or kill sperm) to the devices. Then place them inside your vagina to cover your cervix. You can buy spermicide gel or foam at a drug store.

All three of these barrier methods must be left in place for 6 to 8 hours after having sex to prevent pregnancy. The diaphragm should be taken out within 24 hours. The cap and shield should be taken out within 48 hours.

Female condom

This condom is worn by the woman inside her vagina. It keeps sperm from getting into her body. It is made of thin, flexible, manmade rubber and is packaged with a lubricant. It can be inserted up to 8 hours before having sex. Use a new condom each time you have intercourse. And don't use it and a male condom at the same time.

Male condom

Male condoms are a thin sheath placed over an erect penis to keep sperm from entering a woman's body. Condoms can be made of latex, polyurethane, or "natural/lambskin". The natural kind do not protect against STIs. Condoms work best when used with a vaginal spermicide, which kills the sperm. A new condom needs to be used with each sex act.

Condoms are either:

- Lubricated, which can make sexual intercourse more comfortable
- Non-lubricated, which can also be used for oral sex. It is best to add lubrication to nonlubricated condoms if you use them for vaginal or anal sex. You can use a water-based lubricant, such as K-Y jelly. You can buy them at the drug store. Oil-based lubricants like massage oils, baby oil, lotions, or petroleum jelly will weaken the condom, causing it to tear or break.

Keep condoms in a cool, dry place. If you keep them in a hot place (like a wallet or glove compartment), the latex breaks down. Then the condom can tear or break.

Hormonal methods - Prevent pregnancy by interfering with ovulation, fertilization, and/or implantation of the fertilized egg

Oral contraceptives - combined pill ("The pill")

The pill contains the hormones estrogen and progestin. It is taken daily to keep the ovaries from releasing an egg. The pill also causes changes in the lining of the uterus and the cervical mucus to keep the sperm from joining the egg.

Some women prefer the "extended cycle" pills. These have 12 weeks of pills that contain hormones (active) and 1 week of pills that don't contain hormones (inactive). While taking extended cycle pills, women only have their period three to four times a year.

Many types of oral contraceptives are available. Talk with your doctor about which is best for you.

Your doctor may advise you not to take the pill if you:

- Are older than 35 and smoke

- Have a history of blood clots
- Have a history of breast, liver, or endometrial cancer

Antibiotics may reduce how well the pill works in some women. Talk to your doctor about a backup method of birth control if you need to take antibiotics. Women should wait three weeks after giving birth to begin using birth control that contains both estrogen and progestin. These methods increase the risk of dangerous blood clots that could form after giving birth. Women who delivered by cesarean section or have other risk factors for blood clots, such as obesity, history of blood clots, smoking, or preeclampsia, should wait six weeks.

The patch

Also called by its brand name, Ortho Evra, this skin patch is worn on the lower abdomen, buttocks, outer arm, or upper body. It releases the hormones progestin and estrogen into the bloodstream to stop the ovaries from releasing eggs in most women. It also thickens the cervical mucus, which keeps the sperm from joining with the egg. You put on a new patch once a week for 3 weeks. You don't use a patch the fourth week in order to have a period.

Women should wait three weeks after giving birth to begin using birth control that contains both estrogen and progestin. These methods increase the risk of dangerous blood clots that could form after giving birth. Women who delivered by cesarean section or have other risk factors for blood clots, such as obesity, history of blood clots, smoking, or preeclampsia, should wait six weeks.

Shot/injection

The birth control shot often is called by its brand name Depo-Provera. With this method you get injections, or shots, of the hormone progestin in the buttocks or arm every 3 months. A new type is injected under the skin. The birth control shot stops the ovaries from releasing an egg in most women. It also causes changes in the cervix that keep the sperm from joining with the egg.

Vaginal ring

This is a thin, flexible ring that releases the hormones progestin and estrogen. It works by stopping the ovaries from releasing eggs. It also thickens the cervical mucus, which keeps the sperm from joining the egg. It is commonly called *NuvaRing*, its brand name. You squeeze the ring between your thumb and index finger and insert it into your vagina. You wear the ring for 3 weeks, take it out for the week that you have your period, and then put in a new ring.

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other risk factors for blood clots, such as obesity, history of blood clots, smoking, or preeclampsia, should wait six weeks.

Implantable devices — Devices that are inserted into the body and left in place for a few years.

Implantable rod

This is a matchstick-size, flexible rod that is put under the skin of the upper arm. It is often called by its brand name, Implanon. The rod releases a progestin, which causes changes in the lining of the uterus and the cervical mucus to keep the sperm from joining an egg. Less often, it stops the ovaries from releasing eggs. It is effective for up to 3 years.

Intrauterine devices or IUDs

An IUD is a small device shaped like a "T" that goes in your uterus. There are two types:

- |Copper IUD The copper IUD goes by the brand name ParaGard. It releases a small amount of copper into the uterus, which prevents the sperm from reaching and fertilizing the egg. If fertilization does occur, the IUD keeps the fertilized egg from implanting in the lining of the uterus. A doctor needs to put in your copper IUD. It can stay in your uterus for 5 to 10 years.
- Hormonal IUD The hormonal IUD goes by the brand name Mirena. It is sometimes called an intrauterine system, or IUS. It releases progestin into the uterus, which keeps the ovaries from releasing an egg and causes the cervical mucus to thicken so sperm can't reach the egg. It also affects the ability of a fertilized egg to successfully implant in the uterus. A doctor needs to put in a hormonal IUD. It can stay in your uterus for up to 5 years.

Sterilization implant (essure)

Essure is the first non-surgical method of sterilizing women. A thin tube is used to thread a tiny spring-like device through the vagina and uterus into each fallopian tube. The device works by causing scar tissue to form around the coil. This blocks the fallopian tubes and stops the egg and sperm from joining.

It can take about 3 months for the scar tissue to grow, so it's important to use another form of birth control during this time. Then you will have to return to your doctor for a test to see if scar tissue has fully blocked your tubes.

Surgical sterilization

For women, surgical sterilization closes the fallopian tubes by being cut, tied, or sealed. This stops the eggs from going down to the uterus where they can be fertilized. The surgery can be done a number of ways. Sometimes, a woman having cesarean birth has the procedure done at the same time, so as to avoid having additional surgery later.

For men, having a vasectomy (vuh-SEK-tuh-mee) keeps sperm from going to his penis, so his ejaculate never has any sperm in it. Sperm stays in the system after surgery for about 3 months. During that time, use a backup form of birth control to prevent pregnancy. A simple test can be done to check if all the sperm is gone; it is called a semen analysis.

Emergency contraception

Used if a woman's primary method of birth control fails. It should not be used as a regular method of birth control. Emergency contraception (Plan B One-Step or Next Step). It is also called the "morning after pill.") Emergency contraception keeps a woman from getting pregnant when she has had unprotected vaginal intercourse. "Unprotected" can mean that no method of birth control was used. It can also mean that a birth control method was used but it was used incorrectly, or did not work (like a condom breaking). Or, a woman may have forgotten to take her birth control pills. She also may have been abused or forced to have sex. These are just some of the reasons women may need emergency contraception.

Emergency contraception can be taken as a single pill treatment or in two doses. A single dose treatment works as well as two doses and does not have more side effects. It works by stopping the ovaries from releasing an egg or keeping the sperm from joining with the egg. For the best chances for it to work, take the pill as soon as possible after unprotected sex. It should be taken within 72 hours after having unprotected sex.

A single-pill dose or two-pill dose of emergency contraception is available over-the-counter (OTC) for women ages 17 and older.

Can all types of birth control prevent sexually transmitted infections (STIs)?

No. The male latex condom is the only birth control method proven to help protect you from STIs, including HIV. Research is being done to find out how effective the female condom is at preventing STIs and HIV. For more information, see Will birth control pills protect me from sexually transmitted infections (STIs), including HIV/AIDS?

How well do different kinds of birth control work? Do they have side effects?

All birth control methods work the best if used correctly and every time you have sex. Be sure you know the right way to use them. Sometimes doctors don't explain how to use a method because they assume you already know. Talk with your doctor if you have questions. They are used to talking about birth control. So don't feel embarrassed about talking to him or her. Some birth control methods can take time and practice to learn. For example, some people don't know you can put on a male condom "inside out." Also, not everyone knows you need to leave a little space at the tip of the condom for the sperm and fluid when a man ejaculates, or has an orgasm. The misuse of contraceptives is known as human error and is the main reason why effectiveness is determined by typical use and perfect use. Below is a table showing the percentage of woman experiencing an unintended pregnancy during the first year of typical use and the first year of perfect use of different types of contraception.

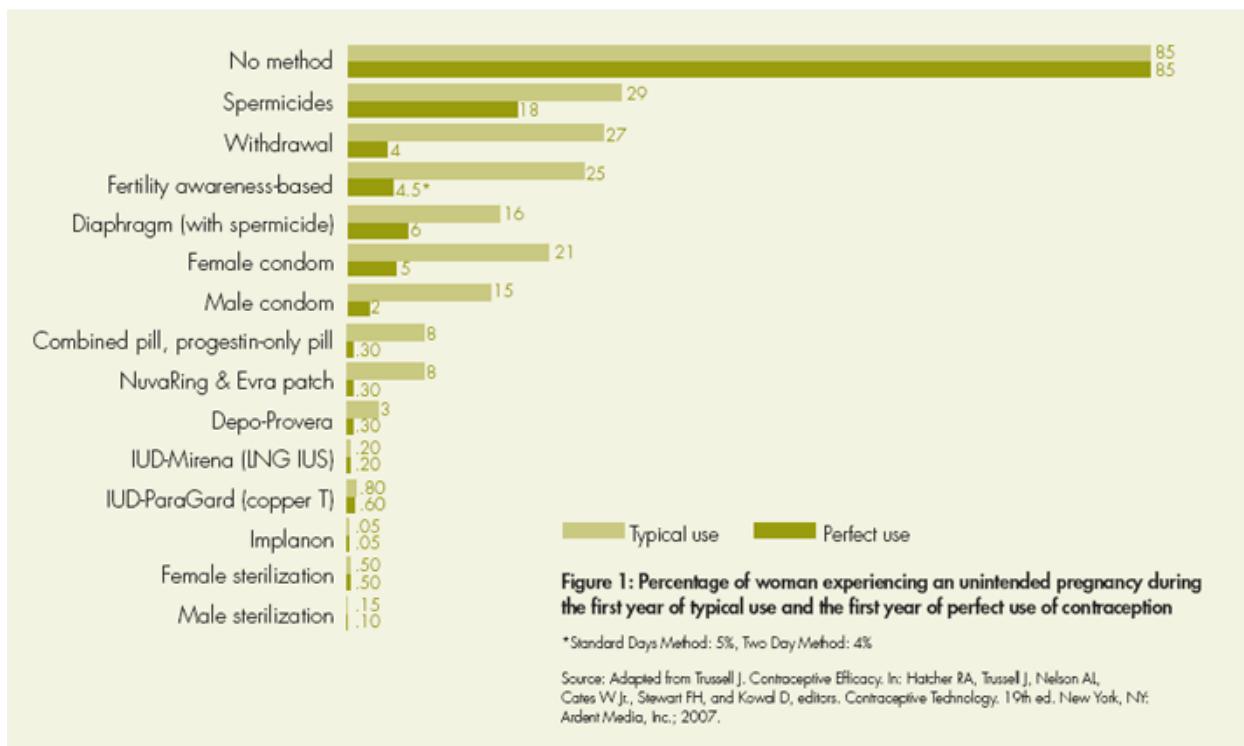


Figure 1. Success Rates of Common Contraception

Where to Get Birth Control

Where you get birth control depends on what method you choose.

You can buy these forms over the counter:

- Male condoms
- Female condoms
- Sponges
- Spermicides
- Emergency contraception pills (girls younger than 17 need a prescription) You need a prescription for these forms:
- Oral contraceptives: the pill, the mini-pill
- Skin patch
- Vaginal ring
- Diaphragm (your doctor needs to fit one to your shape)
- Cervical cap
- Cervical shield
- Shot/injection (you get the shot at your doctor's office)
- IUD (inserted by a doctor)
- Implantable rod (inserted by a doctor) You will need surgery or a medical procedure for:
- Sterilization, female and male

- Spermicides : You can buy spermicides over the counter. They work by killing sperm. They come in many forms:
 - Foam
 - Gel
 - Cream
 - Film
 - Suppository
 - Tablet

Spermicides are put in the vagina no more than 1 hour before having sex. If you use a film, suppository, or tablet, wait at least 15 minutes before having sex so the spermicide can dissolve. Do not douche or rinse out your vagina for at least 6 to 8 hours after having sex. You will need to use more spermicide each time you have sex.

Spermicides work best if used along with a barrier method, such as a condom, diaphragm, or cervical cap. Some spermicides are made just for use with the diaphragm and cervical cap. Check the package to make sure you are buying what you need.

All spermicides contain sperm-killing chemicals. Some contain nonoxynol-9, which may raise your risk of HIV if you use it a lot. It irritates the tissue in the vagina and anus, so it can cause the HIV virus to enter the body more freely. Some women are sensitive to nonoxynol-9 and need to use spermicides without it. Medications for vaginal yeast infections may lower the effectiveness of spermicides. Also, spermicides do not protect against sexually transmitted infections.

Withdrawal

Withdrawal is when a man takes his penis out of a woman's vagina (or "pulls out") before he ejaculates, or has an orgasm. This stops the sperm from going to the egg. "Pulling out" can be hard for a man to do. It takes a lot of self-control. Even if you use withdrawal, sperm can be released before the man pulls out. When a man's penis first becomes erect, pre-ejaculate fluid may be on the tip of the penis. This fluid has sperm in it. So you could still get pregnant. Withdrawal does not protect you from STIs or HIV.

Dental Dams

The dental dam is a square piece of rubber that is used by dentists during oral surgery and other procedures. It is not a method of birth control. But it can be used to help protect people from STIs, including HIV, during oral-vaginal or oral-anal sex. It is placed over the opening to the vagina or the anus before having oral sex. You can buy dental dams at surgical supply stores.

Abortion

Abortion is the ending of pregnancy by removing a fetus or embryo before it can survive outside the uterus. An abortion that occurs spontaneously is also known as a miscarriage.

An abortion may be caused purposely and is then called an induced abortion, or less frequently, "induced miscarriage". The word **abortion** is often used to mean only induced abortions. A similar procedure after the fetus could potentially survive outside the womb is known as a "late termination of pregnancy".

When allowed by law, abortion in the developed world is one of the safest procedures in medicine. Modern methods use medication or surgery for abortions. The drug mifepristone in combination with prostaglandin appears to be as safe and effective as surgery during the first and second trimester of pregnancy. Birth control, such as the pill or intrauterine devices, can be used immediately following abortion. When performed legally and safely, induced abortions do not increase the risk of long-term mental or physical problems. In contrast, unsafe abortions (those performed by unskilled individuals, with hazardous equipment, or in unsanitary facilities) cause 47,000 deaths and 5 million hospital admissions each year. The World Health Organization recommends safe and legal abortions be available to all women.

Around 56 million abortions are performed each year in the world, with about 45% done unsafely. Abortion rates changed little between 2003 and 2008, before which they decreased for at least two decades as access to family planning and birth control increased. As of 2008, 40% of the world's women had access to legal abortions without limits as to reason. Countries that permit abortions have different limits on how late in pregnancy abortion is allowed.

Historically, abortions have been attempted using herbal medicines, sharp tools, with force, or through other traditional methods. Abortion laws and cultural or religious views of abortions are different around the world. In some areas abortion is legal only in specific cases such as rape, problems with the fetus, poverty, risk to a woman's health, or incest. In many places there is much debate over the moral, ethical, and legal issues of abortion.

Those who oppose abortion often maintain that an embryo or fetus is a human with a right to life and may compare abortion to murder. Those who favor the legality of abortion often hold that a woman has a right to make decisions about her own body.

Methods of Abortion

How many weeks a woman is pregnant is usually the main factor in determining which abortion methods are practiced. Below are the two main methods for abortion.

Medical

Medical abortions are performed without entering the uterus. Instead, medical abortions terminate a pregnancy by abortifacient pharmaceuticals, which are drugs that cause abortion. These drugs induce abortion by blocking the action of progesterone, which results in the lining of the embryo being expelled from the uterus, thus terminating the pregnancy.

If medical abortion fails, surgical abortion must be used to complete the procedure. Early medical abortions account for the majority of abortions before 9 weeks gestation in Britain, France, Switzerland, and the Nordic countries. In the United States, the percentage of early medical abortions is far lower.

Medical abortion regimens using mifepristone in combination with a prostaglandin analog are the most common methods used for second-trimester abortions in Canada, most of

Europe, China and India, in contrast to the United States where 96% of second-trimester abortions are performed surgically by dilation and evacuation.

Surgical

Up to 15 weeks' into a pregnancy, suction-aspiration or vacuum aspiration are the most common surgical methods of induced abortion. *Manual vacuum aspiration* (MVA) consists of removing the fetus or embryo, placenta, and membranes by suction using a manual syringe, while *electric vacuum aspiration* (EVA) uses an electric pump. These techniques differ in the mechanism used to apply suction, in how early in pregnancy they can be used, and in whether cervical dilation is necessary.

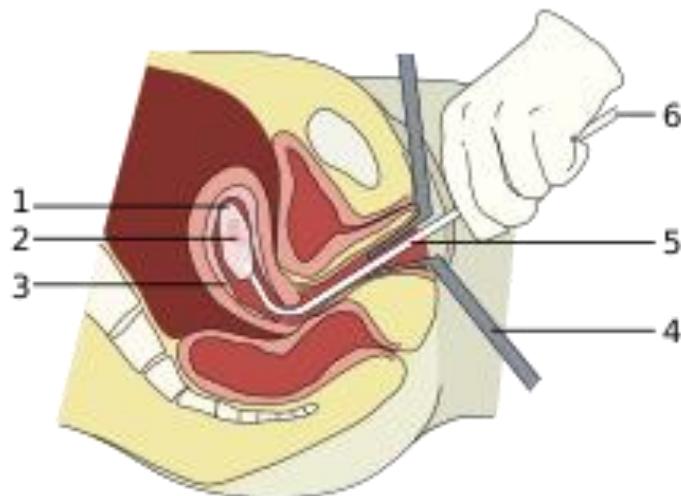


Figure 2. Vacuum Aspiration Abortion

- 1: Amniotic sac
- 2: Embryo
- 3: Uterine lining
- 4: Speculum
- 5: Vacurette
- 6: Attached to a suction pump

MVA, also known as "mini-suction" and "menstrual extraction", can be used in very early pregnancy, and does not require cervical dilation. Dilation and curettage (D&C), the second most common method of surgical abortion, is a standard gynecological procedure performed for a variety of reasons, including examination of the uterine lining for possible malignancy, investigation of abnormal bleeding, and abortion. Curettage refers to cleaning the walls of the uterus with a curette. The World Health Organization recommends this procedure, also called *sharp curettage*, only when MVA is unavailable.

From the 15th week of gestation until approximately the 26th, other techniques must be used. Dilation and evacuation (D&E) consists of opening the cervix of the uterus and emptying it using surgical instruments and suction. After the 16th week of gestation, abortions can also be induced by intact dilation and extraction (IDX) (also called intrauterine cranial decompression), which requires surgical decompression of the fetus's

head before evacuation. IDX is sometimes called "partial-birth abortion", which has been federally banned in the United States.

In the third trimester of pregnancy, induced abortion may be performed surgically by intact dilation and extraction or by hysterotomy. Hysterotomy abortion is a procedure similar to a caesarean section and is performed under general anesthesia. It requires a smaller incision than a caesarean section and is used during later stages of pregnancy. First-trimester procedures can generally be performed using local anesthesia, while second-trimester methods may require deep sedation or general anesthesia.

Abortion Debate

Induced abortion has long been the course of considerable debate.

Ethical, moral, philosophical, biological, religious and legal issues surrounding abortion are related to value systems. Opinions of abortion may be about fetal rights, governmental authority, and women's rights.

In both public and private debate, arguments presented in favor of or against abortion access focus on either the moral permissibility of an induced abortion, or justification of laws permitting or restricting abortion. The World Medical Association Declaration on Therapeutic Abortion notes, "circumstances bringing the interests of a mother into conflict with the interests of her unborn child create a dilemma and raise the question as to whether or not the pregnancy should be deliberately terminated." Abortion debates, especially pertaining to abortion laws, are often spearheaded by groups advocating one of these two positions. Anti-abortion groups who favor greater legal restrictions on abortion, including complete prohibition, most often describe themselves as "**pro-life**" while abortion rights groups who are against such legal restrictions describe themselves as "**pro-choice**". Generally, the former position argues that a human fetus is a human person with a right to live, making abortion morally the same as murder. The latter position argues that a woman has certain reproductive rights, especially the choice whether or not to carry a pregnancy to term.

Roe v. Wade

Roe v. Wade is a landmark decision issued in 1973 by the United States Supreme Court on the issue of the constitutionality of laws that criminalized or restricted access to abortions. The Court ruled 7–2 that a right to privacy under the Due Process Clause of the 14th Amendment extended to a woman's decision to have an abortion, but that this right must be balanced against the state's interests in regulating abortions: protecting women's health and protecting the potentiality of human life. Arguing that these state interests became stronger over the course of a pregnancy, the Court resolved this balancing test by tying state regulation of abortion to the third trimester of pregnancy.

Later, in *Planned Parenthood v. Casey* (1992), the Court rejected *Roe*'s trimester framework while affirming its central holding that a woman has a right to abortion until fetal viability. The *Roe* decision defined "viable" as "potentially able to live outside the mother's womb, albeit with artificial aid." Justices in *Casey* acknowledged that viability may occur at 23 or 24 weeks, or sometimes even earlier, in light of medical advances.

In disallowing many state and federal restrictions on abortion in the United States, *Roe v. Wade* prompted a national debate that continues today about issues including whether, and

to what extent abortion should be legal, who should decide the legality of abortion, what methods the Supreme Court should use in constitutional adjudication, and what the role should be of religious and moral views in the political sphere. *Roe v. Wade* reshaped national politics, dividing much of the United States into pro-life and pro-choice camps, while activating grassroots movements on both sides.

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CHAPTER 7: Infectious diseases and Sexually Transmitted Infections (STI's)

Section 7.1 Introduction

Most people on Earth experience at least one episode of an infectious disease every year. Although the majority recover, hundreds of millions suffer severe or long-term health effects as a direct result of an infection and around 10 million people – many of them children – lose their lives. In the 1960s, it was widely believed that advances in methods of prevention and treatment would overcome the threat to health from infectious diseases. Unfortunately these predictions have proved to be optimistic because of the rapidly increasing threat from 'emerging infectious diseases'.

Section 7.2 What are infectious diseases?

Infectious diseases are distinguished from other illnesses and disorders because they can be transmitted from someone who is ill either directly or indirectly to other individuals, who then develop the same infectious disease and are also able to pass it on. A familiar example is the 'common cold' which almost everyone has experienced at some time in their lives (Figure 1). Non-human animals and plants also suffer from infectious diseases, which cause massive losses to food crops and livestock, but our focus in this course is on infection in humans.

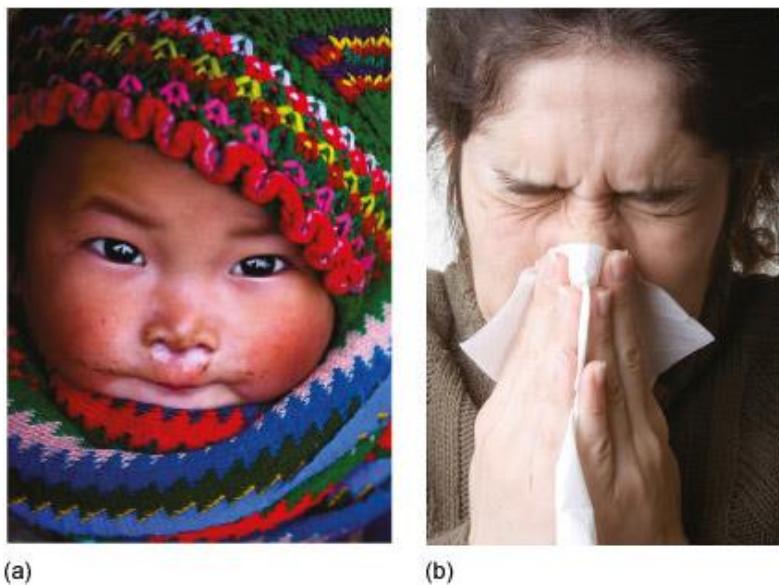


Figure 1. The common cold affects children and adults all over the world: (a) a child from Vietnam. (b) an adult in the United States

By contrast, health problems that cannot be transmitted between individuals, such as heart disease, diabetes, lung cancer, arthritis and depression, are known as non-communicable diseases (or NCDs). However, a few NCDs also have an infectious component, for example:

- in most cases of cervical cancer there is evidence of infection with a specific virus (the human papilloma virus, or HPV)
- hepatitis viruses cause liver disease and cancer of the liver
- a bacterium (*Helicobacter pylori*) causes stomach ulcers.

These examples illustrate the point that there is some overlap between some infectious and non-communicable diseases. For completeness, we should mention here that the third major category of diseases, disorders and disabilities is termed injuries, i.e. physical damage to the body caused by accidents or violence.

Section 7.3 Symptoms and signs of infection

Symptoms are sensations in the body that only the person who is unwell can experience; for example, a headache, pain in the abdomen, blurred vision and nausea are all symptoms, because no one but the sufferer can experience them. Lay people, including children, can usually describe their symptoms accurately or report them if asked the right questions, but symptoms are subjective experiences that others cannot observe or verify.

By contrast, the signs of a disease are indicators of illness that other people *can* observe (e.g. a runny nose and frequent sneezing). Considering the symptoms and signs together may give enough information for a trained health care worker to make a diagnosis, i.e. identify the underlying cause of the illness and give it a definite name.

Section 7.4 What causes infectious diseases?

Infectious diseases are transmitted between individuals by infectious agents, known as pathogens [path-oh-jens], from the Greek word *pathos* (to suffer) and *genēs* (to produce). Pathogens produce a lot of human suffering and disability across the world, including in relatively wealthy nations like the United States. Most people have heard of at least some types of pathogen, for example bacteria or viruses.

The wider causes of infectious diseases range from insanitary living conditions in impoverished communities, to inadequate hygiene in the high-tech environments of modern hospitals (Figure 2). The impact of infectious diseases is therefore unequally distributed around the world, not only between countries, but also between individuals and groups within the same population.



Figure 2. Infectious diseases are a threat everywhere: (a) A shanty settlement without piped water or sanitation in Indonesia. (b) Testing for pathogens in a hospital laboratory in England.

Human biology is another factor to consider in explaining the cause of infectious diseases. Infancy and old age, inadequate nourishment, other illnesses and some types of medication can all create conditions in the body in which infection is more easily established. In addition, there are individual human behaviors, habits and traditional practices that contribute to the causes of infectious diseases by spreading pathogens from one person to another. These behaviors give some clues about the routes by which pathogens can be transmitted, as the next section describes.

Section 7.5 Direct person-to-person transmission of pathogens

A new infection begins when pathogens leave the body of their host – the infected individual in which the pathogens are multiplying – and enter a new host. They may be repelled by defense mechanisms (i.e. skin) in the new host, or they may survive and reproduce in sufficient numbers to cause an infectious disease.

Transmission of pathogens can occur directly between people, or indirectly in the air, water or food, or via other animals to humans, or from sources in the environment. In this section we explore direct transmission.

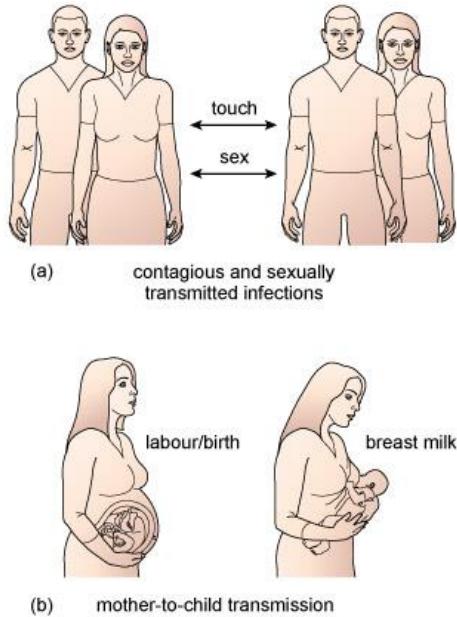


Figure 3. Direct person-to-person transmission of infection. (a) Contagion and sexual transmission. (b) Mother-to-child transmission.

Figure 3 represents the three ways in which pathogens can be transmitted by direct person-to-person contact. They are:

- Contagious infection, when touch, such as a handshake, transfers pathogens to a susceptible person; they may enter the new host through a cut or graze, or be transferred from hand to mouth.
- Sexually transmitted infection (or STI) involving infected semen, vaginal secretions, saliva or blood transmitting pathogens to the infected individual's partner during unprotected sex. This is the most common route for the worldwide spread of HIV (the human immunodeficiency virus), which causes AIDS (acquired immune deficiency syndrome). Sexual transmission is more likely if the partner's genitals, mouth or rectum are inflamed, for example, by another STI such as gonorrhea [gonn-or-ree-ah] or syphilis [siff-ill-iss].
- Mother-to-child transmission, when pathogens pass from mother to baby during labor and delivery, or via breast milk.

Section 7.6 Indirect person-to-person transmission of pathogens

Indirect person-to-person transmission occurs when the original host sheds pathogens into the air, water, food or objects in the environment, which then infect someone else (Figure 4).

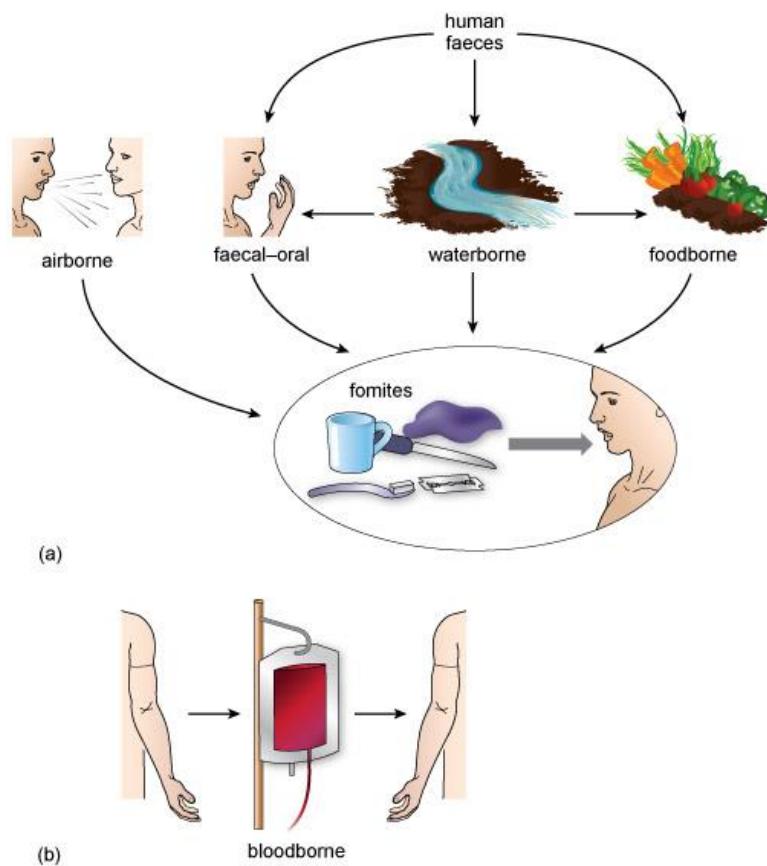


Figure 4. There are many routes for indirect person-to-person transmission of infection. Most airborne infections are transmitted when a cough or sneeze expels fine droplets of water (known as an aerosol) containing millions of bacteria or viruses. The aerosol droplets may be inhaled by a susceptible person, or settle on surfaces where the pathogens contaminate hands, utensils, clothing, water or food, which are then touched or consumed by someone else.



Figure 5. Coughs and sneezes spread diseases!

Waterborne infections are particularly common in parts of the world where large numbers of people don't have access to clean drinking water or safe disposal of sewage. Infected urine and feces from humans and animals can wash into lakes and streams, where the pathogens multiply and re-infect people when they drink or bathe in contaminated water. Some pathogens (including the bacteria that cause cholera, a serious diarrhoeal disease) live naturally in environmental water sources, so they will always pose a threat to health. Fecal-oral infections refer to solid waste, or excrement) occur when pathogens from feces enter the mouth and multiply in the gut. Transmission occurs when unclean hands, dirty cooking utensils or food contaminated by feces enters the mouth. Flies can transfer pathogens from feces to food via their feet. Contact with feces is unavoidable when people are forced to defecate in the open because there is no sanitation. In these cases, people can get contaminated soil on their hands and the pathogens are easily transmitted from hand to mouth if there is no clean water or soap for hand washing.

Diarrhoeal diseases are often transmitted via the fecal-oral route, and some (e.g. cholera) are mainly waterborne. But they may also be due to foodborne infections caused by pathogens that originated in food components, for example, pathogenic bacteria in raw meat, eggs and on salad leaves.

Non-living objects in the environment, such as cups, spoons and door handles that people routinely touch, can also transmit infection and are known collectively as fomites [foh-myitz]. Clothing can also act as a fomite, which is why hospital doctors rarely wear neckties that could drape across a patient during a medical examination and pick up infection that the next patient might acquire.

Medical procedures can also transmit bloodborne infections; for example, before the transmission of HIV was understood, thousands of infections occurred from HIV-contaminated blood transfusions. Bloodborne pathogens can also spread via shared needles and syringes among people who inject illegal drugs, such as heroin.

Section 7.7 Animal-to-human transmission of pathogens

Pathogens are often transmitted from animals to humans 'accidentally', for example via infected meat or water contaminated with animal feces. But there are two transmission routes in which the animal is an essential agent in the transfer of pathogens to humans. An example of zoonosis that may be familiar is influenza originating in pigs (swine flu) or poultry (bird flu). The influenza viruses that cause these diseases can sometimes be transmitted from animals to humans during the slaughter or handling of livestock. Some zoonotic influenza viruses pose a much greater health risk than the airborne seasonal influenza viruses that commonly circulate in human populations every winter.

Another route of transmission from animals to humans results in vector-borne infections. They differ from zoonoses in that they are transmitted by an invertebrate animal (without a backbone), mainly biting insects and ticks. The term 'vector' [vek-torr] comes from the Latin word for 'carrier', so in this context it means a carrier of an infectious disease. The pathogen must complete part of its life cycle in the vector, so transmission to humans may

be prevented if the vectors can be killed. For example, Lyme disease is caused by a bacteria transmitted from birds or small mammals (such as deer) to humans by a type of tick. There are many other vector-borne infections, including bubonic plague transmitted by rat fleas, typhus transmitted by ticks, and yellow fever transmitted by mosquitoes. In 2014, the World Health Organization – the branch of the United Nations responsible for coordinating and directing international policy and actions on health – devoted its annual ‘World Health Day’ to publicize the risk from vector-borne infections.

Emerging infectious diseases

Emerging infectious diseases (EIDs) is the collective term for a group of conditions that pose new threats to human health. EIDs can be distinguished into three types:

- New infectious diseases caused by previously unknown pathogens:^[1] Many of the diseases in this category are caused by zoonotic viruses, i.e. the viruses originated in other vertebrate animals, but at some point in the past they changed in ways that made them infectious to people. The best known ‘new’ infectious disease is AIDS but the virus that causes AIDS (HIV) may have originated in monkeys. Since HIV was identified in 1984, several other new infectious diseases caused by potentially fatal viruses have been identified. They include SARS (Severe Acute Respiratory Syndrome,), which may have originated in poultry, MERS (Middle East Respiratory Syndrome), which may have originated in camels, and zoonotic strains of influenza (swine flu and bird flu).
- Infectious diseases that have spread far outside their original range:^[2] One example is Ebola virus disease (EVD), a ‘haemorrhagic’ [hemm-orr-adj-ik] fever, which means it causes severe internal bleeding, among other symptoms. Cases have occurred from time to time in remote villages in West Africa, but the first urban cases were detected in the capital of Guinea in February 2014 and from there Ebola quickly spread to neighbouring Liberia and Sierra Leone. A few travellers or health workers caring for Ebola patients developed the disease in other countries, including Nigeria, Mali, Senegal and the USA. By October 2015, over 11 000 deaths had occurred from over 28 000 suspected, probable and confirmed cases (Centers for Disease Control and Prevention, 2015). Many of these cases have not been confirmed in a laboratory, so the ‘case fatality rate’ (the proportion of confirmed infected people who die) is unknown; however, it is likely to fall within the range of 30 to 60 per cent.

Previously declining infectious diseases that have resurged:^[3] Tuberculosis and some other infections caused by bacteria are a growing health concern because the causative pathogens are becoming increasingly resistant to antibiotics, which previously treated them successfully. So-called ‘hospital super-bugs’ are bacteria that have developed resistance to antibiotics in health care facilities, where antibiotics are heavily prescribed. An additional factor in countries where HIV/AIDS is common is that infection with HIV

suppresses the body's immune defenses, so people with AIDS are more susceptible to other infections, including TB.



Figure 6. Examples of Five Major Types of Pathogens

Section 7.8 Immune Defenses Against Infectious Diseases

Natural barriers against pathogens

The physical and chemical barriers that prevent pathogens from getting into our body tissues in the first place are often overlooked. As Figure 6 shows, the most comprehensive barrier is the waterproof layer of skin that covers the body's surface. Human skin keeps most pathogens out as long as it remains intact. The speed with which a cut or graze can become infected is a reminder of the protection we normally get from our skin.

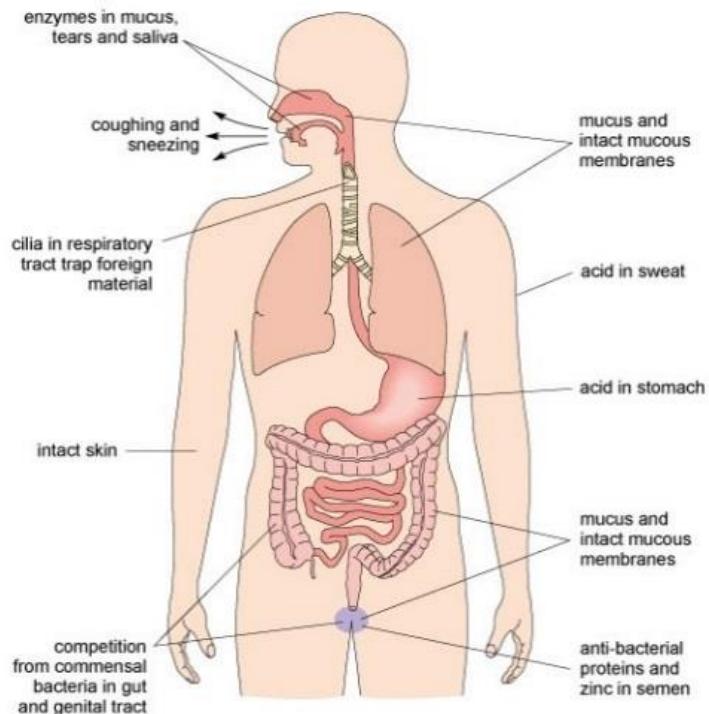


Figure 7. Physical and chemical barriers against infection

Vector-borne infections (e.g. malaria) are transmitted by biting invertebrates (e.g. mosquitoes) penetrating the skin when taking a blood meal. Humans are also vulnerable to

invasion by pathogens in the air, food, water and soil, or during physical contact with infected people, some animals (e.g. pigs, dogs, poultry) or their feces. As Figure 6 illustrates, the inner surface of the respiratory system (nose, throat, airways and lungs), stomach, intestines, bladder and reproductive tract are lined with membranes that secrete jelly-like mucus, presenting a barrier against pathogens entering our tissues via these routes.

Microscopic hairs called cilia [sill-ee-ah] line the respiratory system and 'beat' in unison to shunt mucus containing trapped pathogens towards the nose and mouth, where they can be expelled by coughing and sneezing, or swallowed into the stomach where acid destroys them.

Chemical barriers against infection include enzymes in tears, saliva and mucus that break down the surface of bacteria. The acid in sweat and in the stomach kills cellular pathogens and there are anti-bacterial proteins in semen (the fluid that contains male sperm).

The more complex mechanisms of the immune system are only needed if pathogens breach these physical and chemical barriers.

The immune response to infection

The human immune system is an extremely complex network of interacting cells and biological molecules. The aim here is simply to give you an overview of how an immune response to infection develops, without going into too much detail. It occurs in three overlapping stages, the first of which is triggered when body cells are damaged.

When tissues are injured, the damaged cells release chemicals that trigger the sequence of events described as inflammation. It occurs in response to any type of injury, such as a blow or a cut, an insect bite, or damage caused by pathogens multiplying in body tissues. Inflammation has four characteristic effects at the site of an injury, the first two of which are visible around the splinter shown in Figure 7:

- swelling
- redness
- heat
- pain.



Figure 8. Inflammation of the tissues around a splinter

The inflamed area shows these signs because the local blood vessels dilate (get wider), increasing blood flow into the injury site, so it looks red as well as feeling warmer than the surrounding tissue. The walls of the blood vessels near the injury become leaky, allowing fluid, defensive proteins and immune system cells (described shortly) to flood into the area,

which becomes swollen as a result. One of the proteins released during the inflammatory response also makes the area more sensitive to painful stimuli, so inflamed tissue is sore to touch.

Sites of tissue injury are vulnerable to invasion by pathogens so the benefits of inflammation generally outweigh the discomfort it causes. Flooding the area with fluid dilutes any pathogens that are already present, and the local concentration of immune system cells and defensive proteins enables an immune response to begin more quickly.

Leukocytes: the cells of the immune system

Once the barriers to infection have been breached and inflammation has begun, the active agents of the immune system, the *leukocytes* [loo-koh-sites], get to work. Leukocytes are often described as 'white blood cells' to distinguish them from the red blood cells that transport oxygen around the body; however, calling them 'blood' cells is misleading because leukocytes roam throughout the body tissues and only spend part of their lives in the bloodstream. In fact, they spend more time in the lymphatic system (Figure 8), the network of fine tubules that collect tissue fluid from all over the body and return it to the bloodstream.

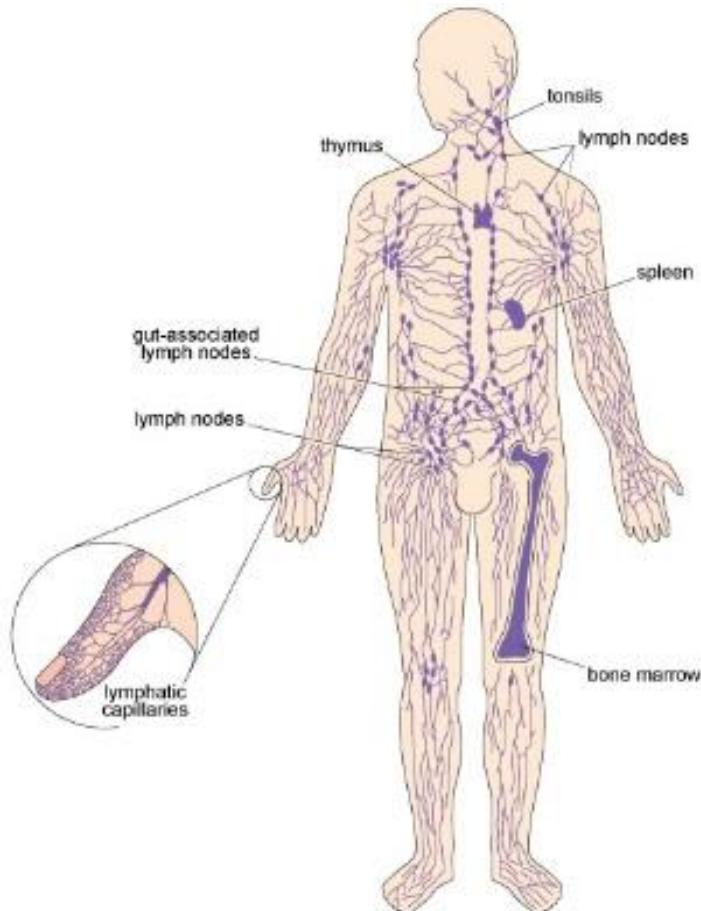


Figure 9. The human lymphatic system

The lymphatic system includes specialized organs and tissues where leukocytes develop. During an immune response to pathogens, we may become aware of swollen lymph nodes (popularly called 'glands') in the neck, armpits or groin, which enlarge when the leukocytes they contain are multiplying near a site of infection.

Leukocytes can distinguish between 'self', the cells and proteins generated by the organism whose body they patrol, and 'non-self' (or 'foreign') material such as pathogens that originated outside the host's body. Leukocytes are *self-tolerant*, i.e. they do not normally attack the host's own cells or body proteins, but direct their actions only against non-self material that may pose a threat.

Although we have referred to 'the' immune response, as if it was just one thing, in fact, there are two types of immune response, distinguished as *innate* and *adaptive* immunity.

Innate immunity

All animals, even those with much simpler bodies than our own (e.g. parasitic worms) respond to tissue damage in ways that resemble inflammation in humans. They have cells similar to leukocytes and defensive proteins that flood into areas of tissue damage or infection. These leukocytes and proteins can defend the organism from pathogens because they recognize common patterns of molecules that occur in the structures of many different types of pathogens. These pathogen 'signature' molecules are known as PAMPs, or *pathogen-associated molecular patterns*.

The fact that PAMPs are commonly found in unrelated pathogens means that the leukocytes that recognize them cannot tell one type of pathogen from another. This *non-specific* immune response against pathogens is so widespread among animals that it is described as innate immunity ('innate' means 'inborn'). Some texts use the alternative term 'natural' immunity.

The leukocytes involved in innate immunity are of two general types, each with a different action against pathogens:

- Cytotoxic [sigh-toh-tox-ik] leukocytes, which simply means 'cell poisoning' (the prefix 'cyto' denotes a cell). These leukocytes have various methods of attaching to the outside of a pathogen and releasing destructive chemicals onto its surface. Worm larvae, bacteria and protists can all be killed this way.
- Phagocytic [fag-oh-sit-ik] leukocytes (the prefix 'phago' comes from a Greek word meaning 'to eat'), often abbreviated to phagocytes [fag-oh-sigh-tz]. These leukocytes engulf small pathogens such as bacteria, drawing them into the cytosol where destructive chemicals break them down. This action is termed phagocytosis [fag-oh-sigh-toh-siss].

The anti-pathogen activities of certain specialized proteins are important contributors to the innate immune response. They include proteins that accelerate inflammation, target leukocytes onto pathogens or make host cells resistant to invasion by viruses. Their

concentration increases rapidly in the bloodstream during an infection and this rise can be detected in blood tests as a diagnostic sign of infection.

In summary, all animals have innate immunity based on cells similar to human leukocytes and defensive proteins that defend the organism against pathogens ‘in general’ in a non-specific way, i.e. these defenses cannot distinguish between one type of pathogen and another. Humans and other warm-blooded animals have an additional defensive capability called *adaptive* immunity, which differentiates specifically between pathogens, as the next section describes.

Adaptive Immunity

Adaptive immunity is due to the actions of two types of specialized leukocytes, known as T cells and B cells. (If you are interested, the letters denote ‘thymus’ and ‘bone marrow’, the tissues where each of these leukocytes mature.) We will describe their individual contributions to the adaptive immune response shortly, but first we focus on the most striking difference between innate and adaptive immunity. The clue lies in the word ‘adaptive’.

T cells and B cells have recognition methods that distinguish between different pathogens (e.g. different species of bacteria), and they *adapt* during their first encounter with a particular pathogen. The second time they meet it in the body, the adaptive response begins earlier, lasts longer and is more effective than it was on the first occasion.

So, there is a much faster and increased response to a subsequent encounter with a pathogen and this demonstrates the adaptability of the immune system. This response is due to the production of long-lived memory cells that circulate in the body after the primary adaptive immune response subsides. These memory cells are specifically programmed to recognize the *same* pathogens that triggered the primary response if they ever get into the body again.

Antigens and the specific recognition of pathogens

Every type of pathogen has at least one (often many more) unique molecules known as antigens in their structure. In addition to the PAMPs (pathogen-associated molecular patterns) shared by many different pathogens, each type of pathogen also has its own unique distinctive antigens. Each individual T cell and B cell (the leukocytes responsible for adaptive immunity) is programmed to recognize just one specific antigen, so it follows that each T or B cell can usually recognize only one type of pathogen, or at most two or three closely related pathogens that have very similar antigens. Recognition of an antigen by these adaptive leukocytes triggers an immune response against only those pathogens with that antigen in their structure. The political slogan ‘One person, one vote’ springs to mind as an analogy for ‘One adaptive leukocyte, one target’!

Antibodies and B cells

Antibodies are very large proteins that contribute to adaptive immunity. A distinguishing feature of antibodies is that their structure includes at least *two* binding sites for antigens. B cells produce antibodies and also use them as their antigen receptors. The B cells carry antibodies embedded by the 'tail' in their outer cell membrane, with the binding sites facing outwards. This enables the B cell to bind to antigens that fit the binding sites in the antibodies it carries on its surface. This binding event is essential (but not sufficient on its own) to activate B cells into making a lot more antibody molecules that recognize the *same* antigen. These antibodies are released by the B cells and circulate in the bloodstream, tissue fluids and the lymphatic system. Antibodies are also abundant in the mucus membranes lining the respiratory system, the gut and the reproductive system, i.e. the sites in the body in contact with substances such as air, food, drinking water and sexual fluids that could contain pathogens.

Antibodies are often portrayed in the media as if they were 'magic bullets' that attack pathogens, but in fact they are more like 'waving flags' with a message that reads 'here is a pathogen – come and destroy it'. When antibodies bind to a pathogen, they simply label it for destruction by leukocytes with the innate ability to phagocytose (engulf) it, or cytotoxic (cell-killing) leukocytes and defensive proteins. You can think of them as recruiting the cells and defensive proteins of the innate immune system to join the attack.

We conclude this tour of adaptive immunity by describing the T cells.

T cells in adaptive immunity

There are two types of T cells with different roles in adaptive immunity. The cytotoxic T cells release destructive chemicals onto their target's outer surface in much the same way as the cytotoxic leukocytes do in an innate immune response. But there is one crucial difference. Cytotoxic T cells are programmed to kill the body's *own* cells that have become infected by viruses or by the few types of bacteria and single-celled pathogens that can 'hide' inside the cells of their host (*Mycobacterium tuberculosis*, the bacteria that cause TB, can do this). Without the cytotoxic T cells, we would be particularly susceptible to infectious diseases caused by these pathogens.

The other T cell type is called the **helper T cells**. They send activation signals to all the other leukocytes involved in inflammation, phagocytosis, cytotoxicity or production of antibodies by B cells. Recognition of a pathogen by binding to it is only the first step. The other leukocytes cannot take action against the pathogens they encounter without activation signals from the helper T cells.

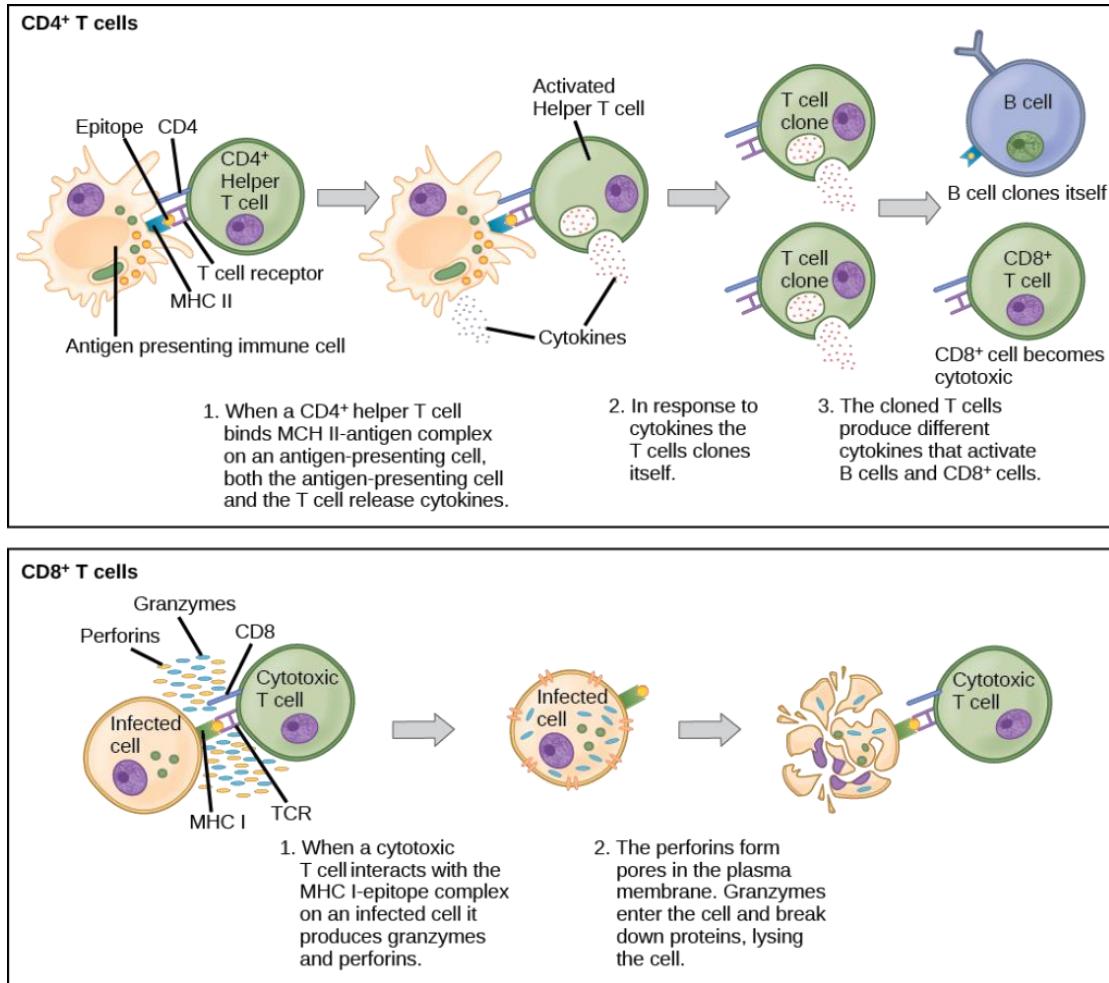


Figure 10. The Cell-Mediated Immune Response

Vaccination

Vaccination relies on the development of immunological memory for its protective effect. Vaccines contain killed pathogens, or extracts from pathogens, or modified strains of pathogens that are no longer harmful. For example, the MMR vaccine contains weakened (the technical term is 'attenuated') variants of the three viruses that cause measles, mumps and rubella (Figure 10).



Figure 11. The MMR vaccine contains live attenuated strains of measles, mumps and rubella viruses.

Note that each of the memory cells and the T cells and B cells generated in an adaptive immune response are specifically directed against just one type of pathogen or a very closely related strain. Vaccination with MMR vaccine is only protective against measles, mumps and rubella infection.

Despite decades of effort, medical science has so far been unable to produce effective vaccines against a number of important infectious diseases, including HIV/AIDS and other sexually transmitted infections (although trials of several candidate vaccines are underway). Vaccines against malaria have shown some potential, but they only protected about half the vaccinated children in large-scale African trials. There are no effective vaccines against infections caused by any other single-celled or multicellular parasites.

Some vaccines are effective only for a relatively short time, e.g. cholera vaccines give protection for only around six months. Others, such as the tetanus vaccine, need repeated booster doses. Annual influenza vaccinations are offered to vulnerable groups in the population because influenza viruses alter their antigens over time.

Opposition to vaccination

Another major challenge is parental opposition to vaccination because of concerns about vaccine safety. Some parents are understandably anxious about taking a healthy child to be given a vaccine derived from infectious agents. Most vaccines are injected, which can be a frightening and painful experience for a child. Of even greater concern is that some children experience a negative reaction to a vaccine, most often inflammation around the injection site and/or a mild fever lasting a day or two, but rare instances of more severe reactions such as convulsions sometimes occur.

Hesitancy about vaccinating a child is increased if parents have no experience of the disease the vaccine prevents, because it has become rare in communities with high vaccine

coverage. Some parents conclude that vaccination is unnecessary and might expose their children to an avoidable risk.

Negative rumors about a vaccine are another deterrent. For example, the myth that vaccination is a Western plot to sterilize Muslim children has deterred parents in northern Nigeria, Pakistan and Afghanistan from allowing their children to be vaccinated against polio (Figure 11). Terrorist attacks have occurred against polio vaccination teams in all three countries – the only remaining locations where polio had not been eradicated by the WHO target of 2015.



Figure 12. Negative rumors about the oral polio vaccine did not deter this Nigerian child's parents from bringing her for vaccination.

An inevitable consequence of falling vaccination rates in a community is an increase in infections, sometimes with fatal outcomes. In 2014, the WHO warned that progress on eliminating measles had stalled and the number of deaths had begun to rise – from 122 000 in 2012 to 145 700 in 2013.

Countries urgently need to prioritize maintaining and improving immunization coverage. Failure to reverse this alarming trend could jeopardize the momentum generated by a decade of achievements in reducing measles mortality.

Even in countries where over 90% of children are fully vaccinated, uptake rates can plummet under pressure from negative rumors. For example, false claims in 1998 that the MMR vaccine caused autism led to a sustained fall in vaccinations in the United States and United Kingdom, followed by a significant rise in measles cases and, to a lesser extent,

mumps. The largest outbreak of measles around Wales in 2012–13 caused more than 1200 cases and one death (Public Health Wales, 2013). Once parents saw the reality of measles infection and the misery and discomfort it causes, a rapid increase in uptake of the MMR vaccine followed the outbreak. The memory of infection fades in well-protected communities, until an outbreak reminds everyone of how devastating infectious diseases can be.

Section 7.9 Risk Factors and Levels of Disease Prevention

What is a Risk Factor?

Part of learning how to take charge of your health requires understanding your risk factors for different diseases. Risk factors are things in your life that increase your chances of getting a certain disease. Some risk factors are beyond your control. You may be born with them or exposed to them through no fault of your own.

Some risk factors that you have little or no control over include your:

- Family history of a disease
- Sex/gender — male or female
- Ancestry

Some risk factors you can control include:

- What you eat
- How much physical activity you get
- Whether you use tobacco
- How much alcohol you drink
- Whether you misuse drugs

In fact, it has been estimated that almost 35 percent of all U.S. premature deaths in 2000 could have been avoided by changing just three behaviors:

- Stopping smoking
- Eating a healthy diet (eating more fruits and vegetables and less red meat)
- Getting more physical activity

You can have one risk factor for a disease or you can have many. The more risk factors you have, the more likely you are to get the disease. For example, if you eat healthy, exercise on a regular basis, and control your blood pressure, your chances of getting heart disease are less than if you are diabetic, a smoker, and inactive. To lower your risks, take small steps toward engaging in a healthy lifestyle, and you'll see big rewards.

People with a family health history of chronic disease may have the most to gain from making lifestyle changes. You can't change your genes, but you can change behaviors that affect your health, such as smoking, inactivity, and poor eating habits. In many cases, making these changes can reduce your risk of disease even if the disease runs in your family. Another change you can make is to have screening tests, such as mammograms and colorectal cancer screening. These screening tests help detect disease early. People who have a family health history of a chronic disease may benefit the most from screening tests that look for risk factors or early signs of disease. Finding disease early, before symptoms appear, can mean better health in the long run.

Section 7.10 Levels of Disease Prevention

Prevention includes a wide range of activities — known as “interventions” — aimed at reducing risks or threats to health. You may have heard researchers and health experts talk about three categories of prevention: primary, secondary and tertiary. What do they mean by these terms?

Primary prevention aims to prevent disease or injury before it ever occurs. This is done by preventing exposures to hazards that cause disease or injury, altering unhealthy or unsafe behaviours that can lead to disease or injury, and increasing resistance to disease or injury should exposure occur. Examples include:

- legislation and enforcement to ban or control the use of hazardous products (e.g. asbestos) or to mandate safe and healthy practices (e.g. use of seatbelts and bike helmets)
- education about healthy and safe habits (e.g. eating well, exercising regularly, not smoking)
- immunization against infectious diseases.

Secondary prevention aims to reduce the impact of a disease or injury that has already occurred. This is done by detecting and treating disease or injury as soon as possible to halt or slow its progress, encouraging personal strategies to prevent reinjury or recurrence, and implementing programs to return people to their original health and function to prevent long-term problems. Examples include:

- regular exams and screening tests to detect disease in its earliest stages (e.g. mammograms to detect breast cancer)
- daily, low-dose aspirins and/or diet and exercise programs to prevent further heart attacks or strokes
- suitably modified work so injured or ill workers can return safely to their jobs.

Tertiary prevention aims to soften the impact of an ongoing illness or injury that has lasting effects. This is done by helping people manage long-term, often-complex health problems and injuries (e.g. chronic diseases, permanent impairments) in order to improve

as much as possible their ability to function, their quality of life and their life expectancy. Examples include:

- cardiac or stroke rehabilitation programs, chronic disease management programs (e.g. for diabetes, arthritis, depression, etc.)
- support groups that allow members to share strategies for living well
- vocational rehabilitation programs to retrain workers for new jobs when they have recovered as much as possible.

Section 7.11 Sexually Transmitted Infections

What are some types of sexually transmitted diseases or sexually transmitted infections (STDs/STIs)?

Approximately 20 different infections are known to be transmitted through sexual contact. Here are descriptions of some of the most common and well known:

- Chlamydia
- Gonorrhea
- Genital Herpes
- HIV/AIDS
- Human Papillomavirus (HPV)
- Syphilis
- Bacterial Vaginosis
- Trichomoniasis
- Viral Hepatitis

Chlamydia



Figure 13. Cervicitis and mucopurulent endocervical discharge in female chlamydial infection.

Chlamydia is a common STD/STI caused by the bacterium *Chlamydia trachomatis*. Chlamydia can be transmitted during vaginal, oral, or anal sexual contact with an infected partner. While many individuals will not experience symptoms, chlamydia can cause fever, abdominal pain, and unusual discharge of the penis or vagina.

In women, whether or not they are having symptoms and know about their infection, chlamydia can cause pelvic inflammatory disease (PID). In PID, the untreated STD/STI progresses and involves other parts of the woman's reproductive system, including the uterus and fallopian tubes. This progression can lead to permanent damage to the woman's reproductive organs. This damage may lead to ectopic pregnancy (in which the fetus develops in abnormal places outside of the womb, a condition that can be life-threatening) and infertility.

Additionally, if the woman is pregnant, her developing fetus is at risk, because chlamydia can be passed on during her pregnancy or delivery and could lead to eye infections or pneumonia in the infant. If chlamydia is detected early, it can be treated easily with an antibiotic taken by mouth.

Gonorrhea

Gonorrhea is caused by the bacterium *Neisseria gonorrhoeae*, which can grow rapidly and multiply easily in the warm, moist areas of the reproductive tract. The most common symptoms of gonorrheal infection are a discharge from the vagina or penis and painful or difficult urination.

As with chlamydial infection, the most common and serious complications of gonorrhea occur in women and include pelvic inflammatory disease (PID), ectopic pregnancy, infertility, and the potential spread to the developing fetus if acquired during pregnancy. Gonorrhea also can infect the mouth, throat, eyes, and rectum and can spread to the blood and joints, where it can become a life-threatening illness.

In addition, people with gonorrhea can more easily contract HIV, the virus that causes AIDS. HIV-infected people with gonorrhea are also more likely to transmit the virus to someone else.

Syphilis

Syphilis infections, caused by the bacterium *Treponema pallidum*, are passed from person to person during vaginal, anal, or oral sex through direct contact with sores, called chancres. Between 2001 and 2009, the Centers for Disease Control and Prevention (CDC) data show that the syphilis rate increased each year. Those people at highest risk for syphilis include men having sex with both men and women and people residing in the south. The first sign of syphilis is a chancre, a painless genital sore that most often appears on the penis or in and around the vagina. Beyond being the first sign of a syphilis infection, chancres make a person two to five times more likely to contract an HIV infection. If the person is already infected with HIV, chancres also increase the likelihood that the virus will be passed on to a sexual partner. These sores typically resolve on their own, even without treatment. However, the body does not clear the infection on its own, and, over time, syphilis may involve other organs, including the skin, heart, blood vessels, liver, bones, and joints in secondary syphilis. If the illness is still not treated, tertiary syphilis can develop

over a period of years and involve the nerves, eyes, and brain and can potentially cause death.

Expectant mothers harboring the bacterium are at an increased risk of miscarriage and stillbirth, and they can pass the infection on to their fetuses during pregnancy and delivery. Infants that acquire congenital syphilis during pregnancy may suffer from skeletal deformity, difficulty with speech and motor development, seizure, anemia, liver disease, and neurologic problems.

STD/STI Data

CDC FACT SHEET **Reported STDs in the United States** **2015 National Data for Chlamydia, Gonorrhea, and Syphilis**

Many cases of chlamydia, gonorrhea, and syphilis continue to go undiagnosed and unreported, and data on several additional STDs — such as human papillomavirus, herpes simplex virus, and trichomoniasis — are not routinely reported to CDC. As a result, the annual surveillance report captures only a fraction of the true burden of STDs in America. However, it provides important insights into the scope, distribution, and trends in STD diagnoses in the country.

STDs are a substantial health challenge facing the United States. CDC estimates that nearly **20 million new sexually transmitted infections** occur every year in this country, half among young people aged 15–24, and account for almost \$16 billion in health care costs. Each of these infections is a potential threat to an individual's immediate and long-term health and well-being. In addition to increasing a person's risk for acquiring and transmitting HIV infection, STDs can lead to chronic pain and severe reproductive health complications, such as infertility and ectopic pregnancy.

Snapshot: STDs in the United States, 2015

Despite recent declines, 2015 was the second year in a row in which increases were seen in all three nationally reported STDs. The approximately 1.5 million cases of chlamydia represent the highest number of annual cases of any condition ever reported to CDC. Substantial increases were also seen among reported cases of gonorrhea and syphilis. While young people and women are most severely affected by STDs, increasing rates among men contributed to the overall increase in 2015 across all diseases.

Chlamydia

- Cases reported in 2015: 1,526,658
- Rate per 100,000 people: 479; increase of 6% since 2014

Gonorrhea

- Cases reported in 2015: 395,216
- Rate per 100,000 people: 124; increase of 13% since 2014

Syphilis (primary and secondary)

- Cases reported in 2015: 23,872
- Rate per 100,000 people: 8; 19% increase since 2014

Syphilis (congenital)

- Cases reported in 2015: 487
- Rate per 100,000 live births: 12; 6% increase since 2014

Figure 14. How STD's Affect Populations in the United States

Gonorrhea and chlamydia primarily affect young people

Surveillance data show both the numbers and rates of reported cases of chlamydia and gonorrhea continue to be highest among young people aged 15-24.

Both young men and young women are heavily affected by STDs — but young women face the most serious long-term health consequences. It is estimated that undiagnosed STDs cause infertility in more than 20,000 women each year.

Most Reported Chlamydia and Gonorrhea Infections Occur among 15-24-Year-Olds

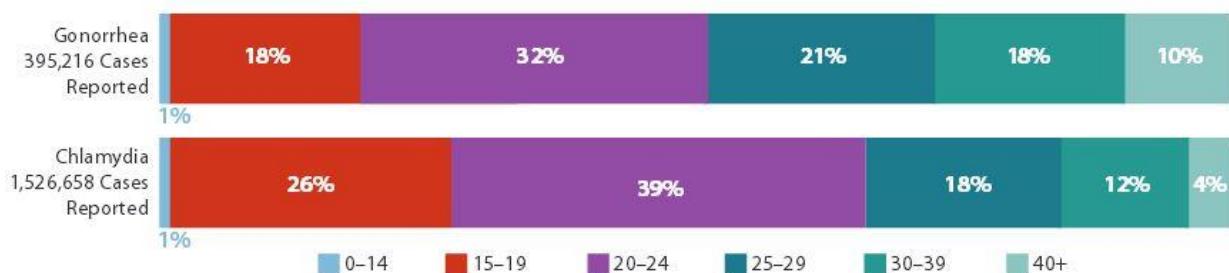


Figure 15. Ages affected by chlamydia and gonorrhea infections

Genital Herpes

Genital herpes is a contagious infection caused by the herpes simplex virus (HSV). There are two different strains, or types, of HSV: herpes simplex virus type 1 (HSV-1) and type 2 (HSV-2). Both can cause genital herpes, although most cases of genital herpes are caused by HSV-2. When symptomatic, HSV-1 usually appears as fever blisters or cold sores on the lips, but it can also infect the genital region through oral-genital or genital-genital contact. Symptomatic HSV-2 typically causes painful, watery skin blisters on or around the genitals

or anus. However, substantial numbers of people who carry these viruses have no or only minimal signs or symptoms.

Neither HSV-1 nor HSV-2 can be cured, and even during times when an infected person has no symptoms, the virus can be found in the body's nerve cells. Periodically, some people will experience outbreaks in which new blisters form on the skin in the genital area; at those times, the virus is more likely to be passed on to other people.

Pregnant women, especially those who acquire genital herpes for the first time during pregnancy, may pass the infection to their newborns, causing life-threatening neonatal HSV, an infection affecting the infant's skin, brain, and other organs.

HIV/AIDS

HIV, or the human immunodeficiency virus, is the virus that causes AIDS (acquired immunodeficiency syndrome). HIV destroys the body's immune system by killing the blood cells that fight infection. Once HIV destroys a substantial proportion of these cells (CD4 cells), the body's ability to fight off and recover from infections is compromised. This advanced stage of HIV infection is known as AIDS.

The CD4 count is like a snapshot of how well your immune system is functioning. CD4 cells (also known as CD4+ T cells) are white blood cells that fight infection. The more you have, the better. These are the cells that the HIV virus kills. As HIV infection progresses, the number of these cells declines. When the CD4 count drops below 200 due to advanced HIV disease, a person is diagnosed with AIDS. A normal range for CD4 cells is about 500-1,500. Usually, when a person with low CD4 cells starts HIV medicines, the CD4 cell count increases as the HIV virus is controlled. Most, but not all, people will experience an increase in CD4 cells with effective HIV treatment.

People whose HIV has progressed to AIDS are very susceptible to opportunistic infections that do not normally make people sick and to certain forms of cancer.

AIDS can be prevented by early initiation of antiretroviral therapy in those with HIV infection. Transmission of the virus primarily occurs during unprotected sexual activity and by sharing needles used to inject intravenous drugs, although the virus also can spread from mother to infant during pregnancy, delivery, and breastfeeding.

In 2013, NIH-supported researchers reported that a 2-year-old child who was born with HIV and was treated starting in the first few days of life has had her HIV infection go into remission. This appears to be the first case of functional cure of HIV.

Human Papillomavirus (HPV)

HPV is the most common STD/STI. More than 40 HPV types exist, and all of them can infect both men and women. The types of HPVs vary in their ability to cause genital warts; infect

other regions of the body, including the mouth and throat; and cause cancers of the cervix, vulva, penis, and mouth.

Although no cure exists for HPV infection once it occurs, regular screening with a Pap smear test can prevent or detect at an early stage most cases of HPV-caused cervical cancer. (A Pap smear test involves a health care provider taking samples of cells from the cervix during a standard gynecologic exam; these cells are examined under a microscope for signs of developing cancer).

A newly available vaccine protects against most (but not all) HPV types that cause cervical cancer. The American Academy of Pediatrics recommends this vaccine for school-aged boys and girls.

Bacterial Vaginosis

Bacterial vaginosis is a common, possibly sexually transmitted, vaginal infection in women of reproductive age. While it is healthy and normal for a vagina to have bacteria, just like the skin, mouth, or gastrointestinal (GI) tract, sometimes changes in the balance of different types of bacteria can cause problems.

Bacterial vaginosis occurs when problematic bacteria that are normally present only in small amounts increase in number, replace normal vaginal lactobacilli bacteria, and upset the usual balance. This situation becomes more likely if a woman douches frequently or has new or multiple sexual partners. The most common sign of a bacterial vaginosis infection is a thin, milky discharge that is often described as having a “fishy” odor. However, some women will have no symptoms at all.

Regardless of symptoms, having bacterial vaginosis increases the risk of getting other STDs/STIs and is also associated with pelvic inflammatory disease (PID), an infection of the female reproductive organs, including the uterus and the fallopian tubes (which carry eggs to the uterus), and postoperative infections. Preterm labor and birth are also possibly more common in women with bacterial vaginosis.

Trichomoniasis

Trichomoniasis infection is caused by the single-celled protozoan parasite *Trichomonas vaginalis* and is common in young, sexually active women. The parasite also infects men, though less frequently. The parasite can be transmitted between men and women as well as between women whenever physical contact occurs between the genital areas.

Although *Trichomonas* infections do not always cause symptoms, they can cause frequent, painful, or burning urination in men and women as well as vaginal discharge, genital soreness, redness, or itching in women. Because the infection can occur without symptoms, a person may be unaware that he or she is infected and continue to re-infect a sexual partner who is having recurrent signs of infection. As with bacterial STDs/STIs, all sexual partners should be treated at the same time to avoid re-infection.

NICHD-sponsored research has shown that during pregnancy, Trichomonas infection is associated with an increased risk of premature birth and infants with low birth weight. Moreover, infants born to mothers with Trichomonas infection are more than twice as likely as infants born to uninfected women to be stillborn or to die as newborns.

Viral Hepatitis

Viral hepatitis is a serious liver disease that can be caused by several different viruses, which can be transmitted through sexual contact.

- Hepatitis A virus (HAV) causes a short-term or self-limited liver infection that can be quite serious, although it does not result in chronic infection. While there are other ways the virus can be transmitted, HAV can be spread from person to person during sexual activity through oral-rectal contact. Vaccination can prevent HAV infection.
- Hepatitis B virus (HBV) causes a serious liver disease that can result in both immediate illness and lifelong infection leading to permanent liver scarring (cirrhosis), cancer, liver failure, and death. HBV spreads through both heterosexual and homosexual contact as well as through contact with other bodily fluids, such as blood, through shared contaminated needles used for injecting intravenous (IV) drugs, tattooing, and piercing. Pregnant women with HBV can transmit the virus to their infants during delivery. HBV infection is preventable through vaccination.
- Hepatitis C virus (HCV) can cause an immediate illness affecting the liver, but it more commonly becomes a silent, chronic infection that leads to liver scarring (cirrhosis), cancer, liver failure, and death. HCV is most commonly transmitted through sharing needles or exposure to infected blood. However, it can spread through sexual contact or from mother to fetus during pregnancy and delivery. There is no vaccine for HCV, and treatments are not always effective.

Section 7.12 STD/STI Treatments

Treatments for Specific Types of Sexually Transmitted Diseases and Sexually Transmitted Infections (STDs/STIs)

- Gonorrhea and Chlamydia
- Genital Herpes
- Human Papillomavirus (HPV)
- Syphilis
- Bacterial Vaginosis
- Trichomoniasis
- Viral Hepatitis
- HIV/AIDS
- During Pregnancy

Gonorrhea and Chlamydia

Gonorrhea and chlamydia are bacterial STDs/STIs that can be treated with antibiotics given either orally or by injection. Because the infections often occur together, people who have one infection are typically treated for both by their health care provider. Recent sexual partners should be treated at the same time.

Genital Herpes

Genital herpes outbreaks can be treated with antiviral drugs. Although this medication can limit the length and severity of outbreaks, it does not cure the infection. In addition, daily suppressive therapy (daily use of antiviral medication) for herpes can reduce the likelihood of transmission to partners. A pregnant woman known to have the infection must take additional care because she can pass the infection to her infant during delivery. Women who first acquire genital HSV during pregnancy are at highest risk of transmission to their infants. If a pregnant woman has an outbreak when she goes into labor, she may need to have a cesarean section (C-section) to prevent the infant from getting the virus during birth.

Human Papillomavirus (HPV)

A person who has an HPV infection cannot be cured. However, many HPV infections can be prevented with vaccination. Furthermore, a health care provider can treat genital warts caused by the virus as well as monitor and control a woman's risk of cervical cancer through frequent screening with Pap smear tests.

Syphilis

If recognized during the early stages, usually within the first year of infection, syphilis can be treated with a singular intramuscular injection of antibiotic. A person being treated for syphilis must avoid sexual contact until the chancre sores caused by the bacteria are completely healed to avoid infecting other people.

If a person does not recognize the infection early, or does not seek treatment immediately, longer treatment with antibiotics may be required. If left untreated, the infection can progress even further and potentially cause death. Although antibiotics can prevent the infection from getting worse, they cannot reverse damage that has already occurred.

Bacterial Vaginosis

Bacterial vaginosis can be treated with antibiotics, typically metronidazole or clindamycin. Generally, male sexual partners of women with bacterial vaginosis do not need to be treated because treatment of partners has not been shown to reduce the risk of recurrence. Treatment during pregnancy is recommended primarily for women at risk for preterm labor or having a low birthweight infant.

Trichomoniasis

Trichomoniasis can be treated with a single dose of an antibiotic, usually either metronidazole or tinidazole, taken by mouth. Often, *Trichomonas* infection recurs, so it is important to make sure that both you and your sexual partners are treated if you are diagnosed with this infection.

Viral Hepatitis

- Hepatitis A virus (HAV) infects the liver and may cause abdominal pain, nausea, and vomiting. Usually the infection gets better on its own without requiring treatment. In some cases, however, individuals may have lasting damage to their livers or may have such severe nausea and vomiting that they must be admitted to the hospital.
- Hepatitis B virus (HBV) can cause a lifelong infection but can be treated with antiviral medications. People with HBV infection will need to see a liver specialist with experience treating individuals with chronic liver disease. These individuals need to take special care not to pass on the virus to their sexual partners, and sexual partners should receive hepatitis B vaccine if not already immune.
- Hepatitis C virus can cause immediate illness affecting the liver or, more commonly, it can be a silent, chronic infection. As with hepatitis B, individuals with HCV may have a lifelong infection and will always be at risk of passing the virus on to their sexual partners. New treatments are available that can clear the infection in some individuals.

[More information about hepatitis A, B, and C can be found on the Centers for Disease Control and Prevention website.](#)

HIV/AIDS

There is no cure for HIV/AIDS. However, research into new treatments has improved outcomes for people living with the disease. A combination of antiretroviral drugs can be given in highly active antiretroviral therapy to control the virus, promote a healthy immune system, help people with the virus live longer lives, and reduce the risk of transmission.

During Pregnancy

Pregnant women who have certain types of STDs/STIs may pass them on to their infants during pregnancy or delivery. Therefore, it is important for women to be tested for such STDs/STIs as part of their early prenatal care to help ensure delivery of a healthy infant. The specific treatment will depend on which STD/STI is involved.

Section 7.13 STD/STI Prevention: How to Prevent STI's

Every year, there are an estimated 20 million new sexually transmitted infections in the United States. Anyone who is sexually active can get an STI. Some groups are disproportionately affected by STI's:

- Adolescents and Young Adults
- Gay, Bisexual, & other Men who have Sex with Men
- Some Racial and Ethnic Minorities

The Good News: STI's ARE preventable. There are steps you can take to keep yourself and your partner(s) healthy. Here's How You Can Avoid (or reduce the risk of) giving or getting an STI:

Practice Abstinence

The surest way to avoid STI's is to not have sex. This means not having vaginal, oral, or anal sex.

Use Condoms

Using a condom correctly every time you have sex can help you avoid STI's. Condoms lessen the risk of infection for all STI's. **You still can get certain STI's, like herpes or HPV, from contact with your partner's skin even when using a condom.**

Most people say they used a condom the first time they ever had sex, but when asked about the last 4 weeks, less than a quarter said they used a condom every time.

Step by step male condom instructions

Have Fewer Partners

Agree to only have sex with one person who agrees to only have sex with you. Make sure you both get tested to know for sure that neither of you has an STI. This is one of the most reliable ways to avoid STI's.

Get Vaccinated



Figure 16. Get Vaccinated!

The most common STI can be prevented by a vaccine. The HPV vaccine is safe, effective, and can help you avoid HPV-related health problems like genital warts and some cancers.

Who should get the HPV vaccine?

- Routine vaccination for boys & girls ages 11 to 12

Catch-up vaccination for:

- Young women ages 13 to 26 and young men ages 13 to 21
- Gay, Bisexual, & other Men who have sex with Men up to age 26
- Men with compromised immune systems up to age 26

Talk With Your Partner

Talk with your sex partner(s) about STI's and staying safe before having sex. It might be uncomfortable to [start the conversation](#), but protecting your health is your responsibility.

Get Tested

Many STI's don't have symptoms, but they can still cause health problems.

- [Talk with your health care provider](#)
- [Search for CDC recommended tests](#)
- [Find a location to get tested for STDs](#)

The only way to know for sure if you have an STI is to get tested.

If You Test Positive...

If either you or your partner is infected with an STI that can be cured (remember, some STI's *cannot* be cured), both of you need to start treatment immediately to avoid getting re-infected.

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Section 8.1 Understanding Drug Use and Addiction

Many people don't understand why or how other people become addicted to drugs. They may mistakenly think that those who use drugs lack moral principles or willpower and that they could stop their drug use simply by choosing to. In reality, drug addiction is a complex disease, and quitting usually takes more than good intentions or a strong will. Drugs change the brain in ways that make quitting hard, even for those who want to. Fortunately, researchers know more than ever about how drugs affect the brain and have found treatments that can help people recover from drug addiction and lead productive lives. Before further studying addiction and recovery, we must first gain an understanding of the different types of drugs and substances and their effects on the body.

Section 8.2 Types of Drugs

Drug abuse is a serious public health problem that affects almost every community and family in some way. Each year drug abuse results in around 40 million serious illnesses or injuries among people in the United States. Abused drugs include:

- Club drugs
- Amphetamines
- Anabolic steroids
- Cocaine
- Heroin
- Inhalants
- Marijuana
- Prescription drugs

Drug abuse also plays a role in many major social problems, such as drugged driving, violence, stress, and child abuse. Drug abuse can lead to homelessness, crime and missed work or problems with keeping a job. There are different types of treatment for drug abuse. But the best is to prevent drug abuse in the first place.

Club Drugs

The term club drug refers to a wide variety of dangerous drugs. These drugs are often used by young adults at all-night dance parties, dance clubs and bars. They include

- Methyleneioxymethamphetamine (MDMA), also known as Ecstasy XTC, X, Adam, Clarity and Lover's Speed
- Gamma-hydroxybutyrate (GHB), also known as Grievous Bodily Harm, G, Liquid Ecstasy and Georgia Home Boy
- Ketamine, also known as Special K, K, Vitamin K, Cat Valium

- Rohypnol, also known as Roofies, Rophies, Roche, Forget-me Pill
- Methamphetamine, also known as Speed, Ice, Chalk, Meth, Crystal, Crank, Fire, Glass
- Lysergic Acid Diethylamide (LSD), also known as or Acid, Boomers, Yellow Sunshines

Club drugs have become more common in recent years. Sometimes people use them to commit sexual assaults. Club drugs can cause serious health problems and sometimes death. They are even more dangerous if you use them with alcohol.

Why Type of Drugs are Club Drugs?

Club drugs are a pharmacologically heterogeneous group of psychoactive drugs that tend to be abused by teens and young adults at bars, nightclubs, concerts, and parties. Gamma hydroxybutyrate (GHB), Rohypnol, ketamine, as well as MDMA (ecstasy) and methamphetamine are some of the drugs included in this group.

- GHB (Xyrem) is a central nervous system (CNS) depressant that was approved by the Food and Drug Administration (FDA) in 2002 for use in the treatment of narcolepsy (a sleep disorder). This approval came with severe restrictions, including its use only for the treatment of narcolepsy, and the requirement for a patient registry monitored by the FDA. GHB is also a metabolite of the inhibitory neurotransmitter gamma-aminobutyric acid (GABA). It exists naturally in the brain, but at much lower concentrations than those found when GHB is abused.
- Rohypnol (flunitrazepam) use began gaining popularity in the United States in the early 1990s. It is a benzodiazepine (chemically similar to sedative-hypnotic drugs such as Valium or Xanax), but it is not approved for medical use in this country, and its importation is banned.
- Ketamine is a dissociative anesthetic, mostly used in veterinary practice.

How Are Club Drugs Abused?

GHB and Rohypnol are available in odorless, colorless, and tasteless forms that are frequently combined with alcohol and other beverages. Both drugs have been used to commit sexual assaults (also known as “date rape,” “drug rape,” “acquaintance rape,” or “drug-assisted” assault) due to their ability to sedate and incapacitate unsuspecting victims, preventing them from resisting sexual assault.

- GHB is usually ingested orally, either in liquid or powder form, while Rohypnol is typically taken orally in pill form. Recent reports, however, have shown that Rohypnol is being ground up and snorted.
- Both GHB and Rohypnol are also abused for their intoxicating effects, similar to other CNS depressants.
- GHB also has anabolic effects (it stimulates protein synthesis) and has been used by bodybuilders to aid in fat reduction and muscle building.
- Ketamine is usually snorted or injected intramuscularly.

How Do Club Drugs Affect the Brain?

- At high doses, GHB's sedative effects may result in sleep, coma, or death.
- Rohypnol can produce anterograde amnesia, in which individuals may not remember events they experienced while under the influence of the drug.
- Ketamine is a dissociative anesthetic, so called because it distorts perceptions of sight and sound and produces feelings of detachment from the environment and self. Low-dose intoxication results in impaired attention, learning ability, and memory. At higher doses, ketamine can cause dreamlike states and hallucinations; and at higher doses still, ketamine can cause delirium and amnesia.

Addictive Potential

Repeated use of GHB may lead to withdrawal effects, including insomnia, anxiety, tremors, and sweating. Severe withdrawal reactions have been reported among patients presenting from an overdose of GHB or related compounds, especially if other drugs or alcohol are involved.

- Like other benzodiazepines, chronic use of Rohypnol can produce tolerance, physical dependence, and addiction.
- There have been reports of people binging on ketamine, a behavior that is similar to that seen in some cocaine- or amphetamine-dependent individuals. Ketamine users can develop signs of tolerance and cravings for the drug.

What Other Adverse Effects Do Club Drugs Have on Health?

Uncertainties about the sources, chemicals, and possible contaminants used to manufacture many club drugs make it extremely difficult to determine toxicity and associated medical consequences. Nonetheless, we do know that:

- Coma and seizures can occur following use of GHB. Combined use with other drugs such as alcohol can result in nausea and breathing difficulties. GHB has been involved in poisonings, overdoses, date rapes, and deaths.
- Rohypnol may be lethal when mixed with alcohol and/or other CNS depressants.
- Ketamine, in high doses, can cause impaired motor function, high blood pressure, and potentially fatal respiratory problems.

Methamphetamine

Methamphetamine is a very addictive stimulant drug. It can be smoked, injected, inhaled or taken by mouth. It has many street names, such as speed, meth, and chalk.

Methamphetamine hydrochloride, the crystal form inhaled by smoking, is referred to as ice,

crystal, glass and tina.

Methamphetamine affects the brain and can create feelings of pleasure, increase energy and elevate mood. Abusers may become addicted quickly, needing higher doses more often. Adverse health effects include irregular heartbeat, increased blood pressure and a variety of psychological problems. Long-term effects may include severe mental disorders, memory loss and severe dental problems.

What Type of Drug is Methamphetamine?

Methamphetamine is a central nervous system stimulant drug that is similar in structure to amphetamine. Due to its high potential for abuse, methamphetamine is classified as a Schedule II drug and is available only through a prescription that cannot be refilled. Although methamphetamine can be prescribed by a doctor, its medical uses are limited, and the doses that are prescribed are much lower than those typically abused. Most of the methamphetamine abused in this country comes from foreign or domestic superlabs, although it can also be made in small, illegal laboratories, where its production endangers the people in the labs, neighbors, and the environment.

How Is Methamphetamine Abused?

Methamphetamine is a white, odorless, bitter-tasting crystalline powder that easily dissolves in water or alcohol and is taken orally, intranasally (snorting the powder), by needle injection, or by smoking.

How Does Methamphetamine Affect the Brain?

Methamphetamine increases the release and blocks the reuptake of the brain chemical (or neurotransmitter) dopamine, leading to high levels of the chemical in the brain—a common mechanism of action for most drugs of abuse. Dopamine is involved in reward, motivation, the experience of pleasure, and motor function. Methamphetamine's ability to release dopamine rapidly in reward regions of the brain produces the intense euphoria, or "rush," that many users feel after snorting, smoking, or injecting the drug.

Chronic methamphetamine abuse significantly changes how the brain functions.

Noninvasive human brain imaging studies have shown alterations in the activity of the dopamine system that are associated with reduced motor skills and impaired verbal learning. Recent studies in chronic methamphetamine abusers have also revealed severe structural and functional changes in areas of the brain associated with emotion and memory, which may account for many of the emotional and cognitive problems observed in chronic methamphetamine abusers.

Repeated methamphetamine abuse can also lead to addiction—a chronic, relapsing disease characterized by compulsive drug seeking and use, which is accompanied by chemical and molecular changes in the brain. Some of these changes persist long after methamphetamine abuse is stopped. Reversal of some of the changes, however, may be observed after sustained periods of abstinence (e.g., more than 1 year).

What Other Adverse Effects Does Methamphetamine Have on Health?

Taking even small amounts of methamphetamine can result in many of the same physical effects as those of other stimulants, such as cocaine or amphetamines, including increased

wakefulness, increased physical activity, decreased appetite, increased respiration, rapid heart rate, irregular heartbeat, increased blood pressure, and hyperthermia. Long-term methamphetamine abuse has many negative health consequences, including extreme weight loss, severe dental problems (“meth mouth”), anxiety, confusion, insomnia, mood disturbances, and violent behavior. Chronic methamphetamine abusers can also display a number of psychotic features, including paranoia, visual and auditory hallucinations, and delusions (for example, the sensation of insects crawling under the skin).

Transmission of HIV and hepatitis B and C can be consequences of methamphetamine abuse. The intoxicating effects of methamphetamine, regardless of how it is taken, can also alter judgment and inhibition and can lead people to engage in unsafe behaviors, including risky sexual behavior. Among abusers who inject the drug, HIV/AIDS and other infectious diseases can be spread through contaminated needles, syringes, and other injection equipment that is used by more than one person. Methamphetamine abuse may also worsen the progression of HIV/AIDS and its consequences. Studies of methamphetamine abusers who are HIV-positive indicate that HIV causes greater neuronal injury and cognitive impairment for individuals in this group compared with HIV-positive people who do not use the drug.

Anabolic Steroids

Anabolic-androgenic steroids (AAS) are synthetically produced variants of the naturally occurring male sex hormone testosterone. “Anabolic” refers to muscle-building, and “androgenic” refers to increased male sexual characteristics. “Steroids” refers to the class of drugs. These drugs can be legally prescribed to treat conditions resulting from steroid hormone deficiency, such as delayed puberty, as well as diseases that result in loss of lean muscle mass, such as cancer and AIDS.

How Are AAS Abused?

Some people, both athletes and non-athletes, abuse AAS in an attempt to enhance performance and/or improve physical appearance. AAS are taken orally or injected, typically in cycles rather than continuously. “Cycling” refers to a pattern of use in which steroids are taken for periods of weeks or months, after which use is stopped for a period of time and then restarted. In addition, users often combine several different types of steroids in an attempt to maximize their effectiveness, a practice referred to as “stacking.”

How Do AAS Affect the Brain?

The acute effects of AAS in the brain are substantially different from those of other drugs of abuse. The most important difference is that AAS are not euphorogenic, meaning they do not trigger rapid increases in the neurotransmitter dopamine, which is responsible for the “high” that often drives substance abuse behaviors. However, long-term use of AAS can eventually have an impact on some of the same brain pathways and chemicals—such as dopamine, serotonin, and opioid systems—that are affected by other drugs of abuse.

Considering the combined effect of their complex direct and indirect actions, it is not surprising that AAS can affect mood and behavior in significant ways.

AAS and Mental Health

Preclinical, clinical, and anecdotal reports suggest that steroids may contribute to psychiatric dysfunction. Research shows that abuse of anabolic steroids may lead to aggression and other adverse effects. For example, although many users report feeling good about themselves while on anabolic steroids, extreme mood swings can also occur, including manic-like symptoms that could lead to violence. Researchers have also observed that users may suffer from paranoid jealousy, extreme irritability, delusions, and impaired judgment stemming from feelings of invincibility.

Addictive Potential

Animal studies have shown that AAS are reinforcing—that is, animals will self-administer AAS when given the opportunity, just as they do with other addictive drugs. This property is more difficult to demonstrate in humans, but the potential for AAS abusers to become addicted is consistent with their continued abuse despite physical problems and negative effects on social relations. Also, steroid abusers typically spend large amounts of time and money obtaining the drug: this is another indication of addiction. Individuals who abuse steroids can experience withdrawal symptoms when they stop taking AAS—these include mood swings, fatigue, restlessness, loss of appetite, insomnia, reduced sex drive, and steroid cravings, all of which may contribute to continued abuse. One of the most dangerous withdrawal symptoms is depression—when persistent, it can sometimes lead to suicide attempts.

Research also indicates that some users might turn to other drugs to alleviate some of the negative effects of AAS. For example, a study of 227 men admitted in 1999 to a private treatment center for dependence on heroin or other opioids found that 9.3 percent had abused AAS before trying any other illicit drug. Of these, 86 percent first used opioids to counteract insomnia and irritability resulting from the steroids.

What Other Adverse Effects Do AAS Have on Health?

Steroid abuse can lead to serious, even irreversible health problems. Some of the most dangerous among these include liver damage; jaundice (yellowish pigmentation of skin, tissues, and body fluids); fluid retention; high blood pressure; increases in LDL (“bad” cholesterol); and decreases in HDL (“good” cholesterol). Other reported effects include renal failure, severe acne, and trembling. In addition, there are some gender- and age-specific adverse effects:

- For *men*—shrinking of the testicles, reduced sperm count, infertility, baldness, development of breasts, increased risk for prostate cancer
- For *women*—growth of facial hair, male-pattern baldness, changes in or cessation of the menstrual cycle, enlargement of the clitoris, deepened voice
- For *adolescents*—stunted growth due to premature skeletal maturation and accelerated puberty changes; risk of not reaching expected height if AAS is taken before the typical adolescent growth spurt

In addition, people who inject AAS run the added risk of contracting or transmitting HIV/AIDS or hepatitis, which causes serious damage to the liver.

Cocaine

Cocaine is a powerful drug that stimulates the brain. People who use it can form a strong addiction. They may have to use more and more of the drug to get high. It's sold on the street as a fine, white powder. There are two forms of cocaine: hydrochloride salt and freebase. The salt dissolves in water. People can take it in a vein or in the nose. The freebase form can be smoked. Crack is the street name of a smokable form of cocaine. No matter how cocaine is taken, it is dangerous. Some of the most common serious problems include

- Heart problems, including heart attacks
- Respiratory effects, including respiratory failure
- Nervous system problems, including strokes
- Digestive problems

Any of these can be fatal. Using cocaine with alcohol is a common cause of drug-related death.

What Type of Drug is Cocaine?

Cocaine is a powerfully addictive stimulant drug. The powdered hydrochloride salt form of cocaine can be snorted or dissolved in water and then injected. Crack is the street name given to the form of cocaine that has been processed to make a rock crystal, which, when heated, produces vapors that are smoked. The term "crack" refers to the crackling sound produced by the rock as it is heated.

How Is Cocaine Abused?

Three routes of administration are commonly used for cocaine: snorting, injecting, and smoking. Snorting is the process of inhaling cocaine powder through the nose, where it is absorbed into the bloodstream through the nasal tissues. Injecting is the use of a needle to insert the drug directly into the bloodstream. Smoking involves inhaling cocaine vapor or smoke into the lungs, where absorption into the bloodstream is as rapid as it is by injection. All three methods of cocaine abuse can lead to addiction and other severe health problems, including increasing the risk of contracting HIV/AIDS and other infectious diseases.

The intensity and duration of cocaine's effects—which include increased energy, reduced fatigue, and mental alertness—depend on the route of drug administration. The faster cocaine is absorbed into the bloodstream and delivered to the brain, the more intense the high. Injecting or smoking cocaine produces a quicker, stronger high than snorting. On the other hand, faster absorption usually means shorter duration of action: the high from snorting cocaine may last 15 to 30 minutes, but the high from smoking may last only 5 to 10 minutes. In order to sustain the high, a cocaine abuser has to administer the drug again.

For this reason, cocaine is sometimes abused in binges—taken repeatedly within a relatively short period of time, at increasingly higher doses.

How Does Cocaine Affect the Brain?

Cocaine is a strong central nervous system stimulant that increases levels of dopamine, a brain chemical (or neurotransmitter) associated with pleasure and movement, in the brain's reward circuit. Certain brain cells, or neurons, use dopamine to communicate. Normally, dopamine is released by a neuron in response to a pleasurable signal (e.g., the smell of good food), and then recycled back into the cell that released it, thus shutting off the signal between neurons.

Cocaine acts by preventing the dopamine from being recycled, causing excessive amounts of the neurotransmitter to build up, amplifying the message to and response of the receiving neuron, and ultimately disrupting normal communication. It is this excess of dopamine that is responsible for cocaine's euphoric effects. With repeated use, cocaine can cause long-term changes in the brain's reward system and in other brain systems as well, which may eventually lead to addiction. With repeated use, tolerance to the cocaine high also often develops. Many cocaine abusers report that they seek but fail to achieve as much pleasure as they did from their first exposure. Some users will increase their dose in an attempt to intensify and prolong the euphoria, but this can also increase the risk of adverse psychological or physiological effects.

What Adverse Effects Does Cocaine Have on Health?

Abusing cocaine has a variety of adverse effects on the body. For example, cocaine constricts blood vessels, dilates pupils, and increases body temperature, heart rate, and blood pressure. It can also cause headaches and gastrointestinal complications such as abdominal pain and nausea. Because cocaine tends to decrease appetite, chronic users can become malnourished as well.

Different methods of taking cocaine can produce different adverse effects. Regular intranasal use (snorting) of cocaine, for example, can lead to loss of the sense of smell; nosebleeds; problems with swallowing; hoarseness; and a chronically runny nose.

Ingesting cocaine can cause severe bowel gangrene as a result of reduced blood flow. Injecting cocaine can bring about severe allergic reactions and increased risk for contracting HIV/AIDS and other blood-borne diseases. Binge-patterned cocaine use may lead to irritability, restlessness, and anxiety. Cocaine abusers can also experience severe paranoia—a temporary state of full-blown paranoid psychosis—in which they lose touch with reality and experience auditory hallucinations.

Regardless of the route or frequency of use, cocaine abusers can experience acute cardiovascular or cerebrovascular emergencies, such as a heart attack or stroke, which may cause sudden death. Cocaine-related deaths are often a result of cardiac arrest or seizure followed by respiratory arrest.

Heroin

Heroin is a drug made from morphine, a natural substance in the seedpod of the Asian poppy plant. Heroin usually appears as a white or brown powder. Heroin can be injected, smoked or snorted. Heroin abuse is a serious problem in the United States. Major health problems from heroin include miscarriages, heart infections and death from overdose. People who inject the drug also risk infectious diseases, including HIV/AIDS and hepatitis. Regular use of heroin can lead to tolerance. This means users need more and more drug to have the same effect. At higher doses over time, the body becomes dependent on heroin. If dependent users stop heroin, they have withdrawal symptoms. These symptoms include restlessness, muscle and bone pain, diarrhea, vomiting and cold flashes.

Heroin is an opiate drug that is synthesized from morphine, a naturally occurring substance extracted from the seed pod of the Asian opium poppy plant. Heroin usually appears as a white or brown powder or as a black sticky substance, known as “black tar heroin.”

How Is Heroin Abused?

Heroin can be injected, snorted/sniffed, or smoked—routes of administration that rapidly deliver the drug to the brain. Injecting is the use of a needle to administer the drug directly into the bloodstream. Snorting is the process of inhaling heroin powder through the nose, where it is absorbed into the bloodstream through the nasal tissues. Smoking involves inhaling heroin smoke into the lungs. All three methods of administering heroin can lead to addiction and other severe health problems.

How Does Heroin Affect the Brain?

Heroin enters the brain, where it is converted to morphine and binds to receptors known as opioid receptors. These receptors are located in many areas of the brain (and in the body), especially those involved in the perception of pain and in reward. Opioid receptors are also located in the brain stem—important for automatic processes critical for life, such as breathing (respiration), blood pressure, and arousal. Heroin overdoses frequently involve a suppression of respiration.

After an intravenous injection of heroin, users report feeling a surge of euphoria (“rush”) accompanied by dry mouth, a warm flushing of the skin, heaviness of the extremities, and clouded mental functioning. Following this initial euphoria, the user goes “on the nod,” an alternately wakeful and drowsy state. Users who do not inject the drug may not experience the initial rush, but other effects are the same.

With regular heroin use, tolerance develops, in which the user’s physiological (and psychological) response to the drug decreases, and more heroin is needed to achieve the same intensity of effect. Heroin users are at high risk for addiction—it is estimated that about 23 percent of individuals who use heroin become dependent on it.

What Other Adverse Effects Does Heroin Have on Health?

Heroin abuse is associated with serious health conditions, including fatal overdose, spontaneous abortion, and—particularly in users who inject the drug—infectious diseases, including HIV/AIDS and hepatitis. Chronic users may develop collapsed veins, infection of

the heart lining and valves, abscesses, and liver or kidney disease. Pulmonary complications, including various types of pneumonia, may result from the poor health of the abuser as well as from heroin's depressing effects on respiration. In addition to the effects of the drug itself, street heroin often contains toxic contaminants or additives that can clog blood vessels leading to the lungs, liver, kidneys, or brain, causing permanent damage to vital organs.

Chronic use of heroin leads to physical dependence, a state in which the body has adapted to the presence of the drug. If a dependent user reduces or stops use of the drug abruptly, he or she may experience severe symptoms of withdrawal. These symptoms—which can begin as early as a few hours after the last drug administration—can include restlessness, muscle and bone pain, insomnia, diarrhea and vomiting, cold flashes with goose bumps ("cold turkey"), and kicking movements ("kicking the habit"). Users also experience severe craving for the drug during withdrawal, which can precipitate continued abuse and/or relapse.

Major withdrawal symptoms peak between 48 and 72 hours after the last dose of the drug and typically subside after about 1 week. Some individuals, however, may show persistent withdrawal symptoms for months. Although heroin withdrawal is considered less dangerous than alcohol or barbiturate withdrawal, sudden withdrawal by heavily dependent users who are in poor health is occasionally fatal. In addition, heroin craving can persist years after drug cessation, particularly upon exposure to triggers such as stress or people, places, and things associated with drug use.

Heroin abuse during pregnancy, together with related factors like poor nutrition and inadequate prenatal care, has been associated with adverse consequences including low birthweight, an important risk factor for later developmental delay. If the mother is regularly abusing the drug, the infant may be born physically dependent on heroin and could suffer from serious medical complications requiring hospitalization.

Marijuana

Marijuana is the most commonly abused illicit drug in the United States. It is a dry, shredded green and brown mix of flowers, stems, seeds, and leaves derived from the hemp plant *Cannabis sativa*. The main active chemical in marijuana is delta-9-tetrahydrocannabinol, or THC for short.

How is Marijuana Abused?

Marijuana is usually smoked as a cigarette (joint) or in a pipe. It is also smoked in blunts, which are cigars that have been emptied of tobacco and refilled with a mixture of marijuana and tobacco. This mode of delivery combines marijuana's active ingredients with nicotine and other harmful chemicals. Marijuana can also be mixed in food or brewed as a tea. As a more concentrated, resinous form, it is called hashish; and as a sticky black liquid, hash oil. Marijuana smoke has a pungent and distinctive, usually sweet-and-sour odor.

How Does Marijuana Affect the Brain?

Scientists have learned a great deal about how THC acts in the brain to produce its many effects. When someone smokes marijuana, THC rapidly passes from the lungs into the bloodstream, which carries the chemical to the brain and other organs throughout the body.

THC acts upon specific sites in the brain, called cannabinoid receptors, kicking off a series of cellular reactions that ultimately lead to the "high" that users experience when they smoke marijuana. Some brain areas have many cannabinoid receptors; others have few or none. The highest density of cannabinoid receptors are found in parts of the brain that influence pleasure, memory, thinking, concentrating, sensory and time perception, and coordinated movement.

Not surprisingly, marijuana intoxication can cause distorted perceptions, impaired coordination, difficulty with thinking and problem solving, and problems with learning and memory. Research has shown that, in chronic users, marijuana's adverse impact on learning and memory can last for days or weeks after the acute effects of the drug wear off. As a result, someone who smokes marijuana every day may be functioning at a suboptimal intellectual level all of the time.

Research into the effects of long-term cannabis use on the structure of the brain has yielded inconsistent results. It may be that the effects are too subtle for reliable detection by current techniques. A similar challenge arises in studies of the effects of chronic marijuana use on brain function. Brain imaging studies in chronic users tend to show some consistent alterations, but their connection to impaired cognitive functioning is far from clear. This uncertainty may stem from confounding factors such as other drug use, residual drug effects, or withdrawal symptoms in long-term chronic users.

What Other Adverse Effect Does Marijuana Have on Health?

1. Effects on the Heart: Marijuana increases heart rate by 20-100 percent shortly after smoking; this effect can last up to 3 hours. In one study, it was estimated that marijuana users have a 4.8-fold increase in the risk of heart attack in the first hour after smoking the drug. This may be due to increased heart rate as well as the effects of marijuana on heart rhythms, causing palpitations and arrhythmias. This risk may be greater in aging populations or in those with cardiac vulnerabilities.
2. Effects on the Lungs: Numerous studies have shown marijuana smoke to contain carcinogens and to be an irritant to the lungs. In fact, marijuana smoke contains 50-70 percent more carcinogenic hydrocarbons than tobacco smoke. Marijuana users usually inhale more deeply and hold their breath longer than tobacco smokers do, which further increase the lungs' exposure to carcinogenic smoke. Marijuana smokers show dysregulated growth of epithelial cells in their lung tissue, which could lead to cancer; however, a recent case-controlled study found no positive associations between marijuana use and lung, upper respiratory, or upper digestive tract cancers. Thus, the link between marijuana smoking and these cancers remains unsubstantiated at this time.

Nonetheless, marijuana smokers can have many of the same respiratory problems

as tobacco smokers, such as daily cough and phlegm production, more frequent acute chest illness, and a heightened risk of lung infections. A study of 450 individuals found that people who smoke marijuana frequently but do not smoke tobacco have more health problems and miss more days of work than nonsmokers. Many of the extra sick days among the marijuana smokers in the study were for respiratory illnesses.

How Widespread is Marijuana Abuse?

Source: National Survey on Drug Use and Health (NSDUH)

According to the National Survey on Drug Use and Health, in 2009, 16.7 million Americans aged 12 or older used marijuana at least once in the month prior to being surveyed, an increase over the rates reported in all years between 2002 and 2008. There was also a significant increase among youth aged 12-17, with current use up from 6.7 percent in 2008 to 7.3 percent in 2009, although this rate is lower than what was reported in 2002 (8.2 percent). Past-month use also increased among those 18-25, from 16.5 percent in 2008 to 18.1 percent in 2009.

Is Marijuana Medicine?

The potential medicinal properties of marijuana have been the subject of substantive research and heated debate. Scientists have confirmed that the cannabis plant contains active ingredients with therapeutic potential for relieving pain, controlling nausea, stimulating appetite, and decreasing ocular pressure. Cannabinoid-based medications include synthetic compounds, such as dronabinol (Marinol®) and nabilone (Cesamet®), which are FDA approved, and a new, chemically pure mixture of plant-derived THC and cannabidiol called Sativex®, formulated as a mouth spray and approved in Canada and parts of Europe for the relief of cancer-associated pain and spasticity and neuropathic pain in multiple sclerosis.

Scientists continue to investigate the medicinal properties of THC and other cannabinoids to better evaluate and harness their ability to help patients suffering from a broad range of conditions, while avoiding the adverse effects of smoked marijuana.

Section 8.3 Prescription Drugs

Most people take medicines only for the reasons their doctors prescribe them. But an estimated 20 percent of people in the United States have used prescription drugs for nonmedical reasons. This is prescription drug abuse. It is a serious and growing problem. Abusing some prescription drugs can lead to addiction. You can develop an addiction to:

- Narcotic painkillers
- Sedatives and tranquilizers
- Stimulants

Experts don't know exactly why this type of drug abuse is increasing. The availability of drugs is probably one reason. Doctors are prescribing more drugs for more health problems than ever before. Online pharmacies make it easy to get prescription drugs without a prescription, even for younger people.

Commonly Abused Prescription Drugs

Medications can be effective when they are used properly, but some can be addictive and dangerous when abused. Some prescribed medications that - when used in ways or by people other than prescribed - have the potential for adverse medical consequences, including addiction.

In 2010, approximately 16 million Americans reported using a prescription drug for nonmedical reasons in the past year; 7 million in the past month.

After marijuana, prescription and over-the-counter medications account for most of the commonly abused drugs.

What types of prescription drugs are abused?

Three types of drugs are abused most often:

- Opioids—prescribed for pain relief
- CNS depressants—barbiturates and benzodiazepines prescribed for anxiety or sleep problems (often referred to as sedatives or tranquilizers)
- Stimulants—prescribed for attention-deficit hyperactivity disorder (ADHD), the sleep disorder narcolepsy, or obesity.

How can you help prevent prescription drug abuse?

- Ask your doctor or pharmacist about your medication, especially if you are unsure about its effects.
- Keep your doctor informed about all medications you are taking, including over-the-counter medications.
- Read the information your pharmacist provides before starting to take medications.
- Take your medication(s) as prescribed.
- Keep all prescription medications secured at all times and properly dispose of any unused medications.

Prescription Drug Advertising

Your healthcare provider is the best source of information about the right medicines for you. The Food and Drug Administration (FDA) protects public health by assuring the safety, effectiveness, and security of a wide range of products, including human prescription

drugs. We also advance public health by helping people get the accurate, science-based information they need to use medicines appropriately and improve their health. Prescription drug advertisements can provide useful information for consumers to work with their health care providers to make wise decisions about treatment.

FDA Authority Over Advertising

The FDA serves the public health and welfare in many ways. One way is overseeing the approval and marketing of prescription drugs. Its authority is based on a number of federal laws, including the Federal Food, Drug, and Cosmetic Act. Among other areas, this law specifically addresses prescription drug advertising. This law requires that advertisements for prescription drugs be accurate and not misleading.

Direct-to-consumer (DTC) advertising is a relatively new area of prescription drug promotion. No federal law has ever banned DTC advertising. Until the mid-1980s, drug companies gave information about prescription drugs only to doctors and pharmacists. When these professionals thought it appropriate, they gave that information to their patients. However, during the 1980s, some drug companies started to give the general public more direct access to this information through DTC ads.

The law requires that product claim ads give a "fair balance" of information about drug risks as compared with information about drug benefits. This means that the content and presentation of a drug's most important risks must be reasonably similar to the content and presentation of its benefits.

This does not mean that equal space must be given to risks and benefits in print ads, or equal time to risks and benefits in broadcast ads. The amount of time or space needed to present risk information will depend on the drug's risks and the way that both the benefits and risks are presented.

Think about the following questions when you see an ad for a prescription drug. Also, think about asking these questions when you talk to your doctor or pharmacist about a drug.

- What condition does this drug treat?
- Why do I think that I might have this condition?
- If I have the condition, am I part of the population the drug is approved to treat?
- Should I take this drug if I have a certain condition?
- Should I take this drug if I am taking certain other drugs?
- Which of the drug's possible side effects am I concerned about?
- How will this drug affect other drugs I am taking?
- Will foods, beverages (alcoholic or non-alcoholic), vitamins, or other supplements affect how this drug works?
- Are there other drugs that treat my condition?
- Is there a less costly drug I could use to treat my condition?
- What else can I do to help deal with my condition? For example, should I exercise or change my diet?

- Do other drugs for my condition have different side effects?
- How can I learn more about this condition and this drug?

Harmful Interactions: Mixing Alcohol with Medicines

You've probably seen this warning on medicines you've taken. The danger is real. Mixing alcohol with certain medications can cause nausea and vomiting, headaches, drowsiness, fainting, or loss of coordination. It also can put you at risk for internal bleeding, heart problems, and difficulties in breathing. In addition to these dangers, alcohol can make a medication less effective or even useless, or it may make the medication harmful or toxic to your body. Some medicines that you might never have suspected can react with alcohol, including many medications which can be purchased "over-the-counter"—that is, without a prescription. Even some herbal remedies can have harmful effects when combined with alcohol.

Medications are safe and effective when used appropriately. Your pharmacist or other health care provider can help you determine which medications interact harmfully with alcohol.

Did You Know...

Mixing alcohol and medicines can be harmful. Alcohol, like some medicines, can make you sleepy, drowsy, or lightheaded. Drinking alcohol while taking medicines can intensify these effects. You may have trouble concentrating or performing mechanical skills. Small amounts of alcohol can make it dangerous to drive, and when you mix alcohol with certain medicines you put yourself at even greater risk. Combining alcohol with some medicines can lead to falls and serious injuries, especially among older people.

Medicines may have many ingredients

Some medications—including many popular painkillers and cough, cold, and allergy remedies—contain more than one ingredient that can react with alcohol. Read the label on the medication bottle to find out exactly what ingredients a medicine contains. Ask your pharmacist if you have any questions about how alcohol might interact with a drug you are taking.

Some medicines contain alcohol

Certain medicines contain up to 10 percent alcohol. Cough syrup and laxatives may have some of the highest alcohol concentrations.

Alcohol affects women differently

Women, in general, have a higher risk for problems than men. When a woman drinks, the alcohol in her bloodstream typically reaches a higher level than a man's even if both are drinking the same amount. This is because women's bodies generally have less water than men's bodies. Because alcohol mixes with body water, a given amount of alcohol is more concentrated in a woman's body than in a man's. As a result, women are more susceptible to alcohol-related damage to organs such as the liver.

Older people face greater risk

Older people are at particularly high risk for harmful alcohol–medication interactions. Aging slows the body's ability to break down alcohol, so alcohol remains in a person's system longer. Older people also are more likely to take a medication that interacts with alcohol—in fact, they often need to take more than one of these medications.

Timing is important

Alcohol and medicines can interact harmfully even if they are not taken at the same time.

Remember...

Mixing alcohol and medicines puts you at risk for dangerous reactions. Protect yourself by avoiding alcohol if you are taking a medication and don't know its effect. To learn more about a medicine and whether it will interact with alcohol, talk to your pharmacist or other health care provider.

Section 8.4 Alcohol Abuse

If you are like many Americans, you drink alcohol at least occasionally. For many people, moderate drinking is probably safe. It may even have health benefits, including reducing your risk of certain heart problems. Moderate drinking is one drink a day for women or anyone over 65, and two drinks a day for men under 65.

Some people should not drink at all, including alcoholics, children, pregnant women, people on certain medicines and people with some medical conditions.

Anything more than moderate drinking can be risky. Binge drinking - drinking five or more drinks at one time - can damage your health and increase your risk for accidents, injuries and assault. Years of heavy drinking can lead to liver disease, heart disease, cancer and pancreatitis. It can also cause problems at home, at work and with friends.

Quick Quiz

1. How many drinks for males within a short period of time is considered binge drinking? How many drinks for females within a short period of time is considered binge drinking?
2. True or false: Binge drinking is a risk factor for sexual assault, especially among young women in college settings. Each year, about 1 in 20 college women are sexually assaulted. Binge drinking also increases the chances of car crashes, violence against others, unintended pregnancies, and the spread of HIV and sexually transmitted diseases.
3. What is the most commonly used and abused substance among youth in the United States, more than tobacco and illicit drugs?
4. True or false: Teens and young adults who do not get enough sleep are at risk for automobile crashes, poor grades and performance in school, depressed moods, and problems with peer and adult relationships.

Quick Quiz Answers: 1) males-5 or more within a short period of time, females- 4 or more within a short period of time; 2) true; 3) Alcohol; 4) true

Beyond Hangovers

A brightly colored cosmopolitan is the drink of choice for the glamorous characters in Sex and the City. James Bond depends on his famous martini—shaken, not stirred—to unwind with after confounding a villain. And what wedding concludes without a champagne toast? Alcohol is part of our culture—it helps us celebrate and socialize, and it enhances our religious ceremonies. But drinking too much—on a single occasion or over time—can have serious consequences for our health. Most Americans recognize that drinking too much can lead to accidents and dependence. But that's only part of the story. In addition to these serious problems, alcohol abuse can damage organs, weaken the immune system, and contribute to cancers. Plus, much like smoking, alcohol affects different people differently. Genes, environment, and even diet can play a role in whether you develop an alcohol-related disease.

On the flip side, some people actually may benefit from drinking alcohol in small quantities. Sound complicated? It sure can be. To stay healthy, and to decide what role alcohol should play in your life, you need accurate, up-to-date information. This chapter is designed to offer you guidance based on the latest research on alcohol's effect on your health.

Moderate or “low-risk” drinking

Research shows that people who drink moderately may be less likely to experience an alcohol use disorder (AUD). These drinking levels, which differ for men and women, are:

For men:

- No more than 4 drinks on any single day AND no more than 14 drinks per week

For women:

- No more than 3 drinks on any single day AND no more than 7 drinks per week
- To stay low risk for AUDs, you must keep within both the single-day and weekly limits. Even within these limits, you can have problems if you drink too quickly or have other health issues. To keep your risk for problems low, make sure you:

- Drink slowly
- Eat enough while drinking

Certain people should avoid alcohol completely, including those who:

- Plan to drive a vehicle or operate machinery
- Take medications that interact with alcohol
- Have a medical condition that alcohol can aggravate
- Are pregnant or trying to become pregnant

Heavy or “at-risk” drinking

For healthy adults in general, heavy drinking means consuming more than the single-day or the weekly amounts listed above. About 1 in 4 people who drink above these levels already has alcohol dependence or alcohol abuse problems.

Binge drinking

Binge drinking means drinking so much within about 2 hours that blood alcohol concentration (BAC) levels reach 0.08g/dL. For women, this usually occurs after about 4 drinks, and for men, after about 5.

Drinking this way can pose health and safety risks, including car crashes and injuries. Over the long term, binge drinking can damage the liver and other organs.

A Little Goes a Long Way: Know the Amounts

Knowing how much alcohol constitutes a “standard” drink can help you determine how much you are drinking and understand the risks. One standard drink contains about 0.6 fluid ounces or 14 grams of pure alcohol. In more familiar terms, the following amounts constitute one standard drink:

- 12 fluid ounces of beer (about 5% alcohol)
- 8 to 9 fluid ounces of malt liquor (about 7% alcohol)
- 5 fluid ounces of table wine (about 12% alcohol)
- 1.5 fluid ounces of hard liquor (about 40% alcohol)

You're chatting with friends at a party and a waitress comes around with glasses of champagne. You drink one, then another, maybe even a few more. Before you realize it, you are laughing more loudly than usual and swaying as you walk. By the end of the evening, you are too slow to move out of the way of a waiter with a dessert tray and have trouble speaking clearly. The next morning, you wake up feeling dizzy and your head hurts. You may have a hard time remembering everything you did the night before.

These reactions illustrate how quickly and dramatically alcohol affects the brain. The brain is an intricate maze of connections that keeps our physical and psychological processes running smoothly. Disruption of any of these connections can affect how the brain works. Alcohol also can have longer-lasting consequences for the brain—changing the way it looks and works and resulting in a range of problems.

Most people do not realize how extensively alcohol can affect the brain. But recognizing these potential consequences will help you make better decisions about what amount of alcohol is appropriate for you.

What happens inside the brain?

The brain's structure is complex. It includes multiple systems that interact to support all of your body's functions—from thinking to breathing to moving.

These multiple brain systems communicate with each other through about a trillion tiny nerve cells called neurons. Neurons in the brain translate information into electrical and chemical signals the brain can understand. They also send messages from the brain to the rest of the body.

Chemicals called *neurotransmitters* carry messages between the neurons.

Neurotransmitters can be very powerful. Depending on the type and the amount of neurotransmitter, these chemicals can either intensify or minimize your body's responses, your feelings, and your mood. The brain works to balance the neurotransmitters that speed things up with the ones that slow things down to keep your body operating at the right pace.

Alcohol can slow the pace of communication between neurotransmitters in the brain.

Fetal Alcohol Syndrome

Alcohol can affect the brain at any stage of development—even before birth. Fetal alcohol spectrum disorders are the full range of physical, learning, and behavioral problems, and other birth defects that result from prenatal alcohol exposure. The most serious of these disorders, *fetal alcohol syndrome* (FAS), is characterized by abnormal facial features and is usually associated with severe reductions in brain function and overall growth. FAS is the leading preventable birth defect associated with mental and behavioral impairment in the United States today.

The brains of children with FAS are smaller than normal and contain fewer cells, including neurons. These deficiencies result in life-long learning and behavioral problems. Current research is investigating whether the brain function of children and adults with FAS can be improved with complex rehabilitative training, dietary supplements, or medications.

Alcohol and Heart Disease

Americans know how prevalent heart disease is—about 1 in 12 of us suffer from it. What we don't always recognize are the connections heart disease shares with alcohol. On the one hand, researchers have known for centuries that excessive alcohol consumption can damage the heart. Drinking a lot over a long period of time or drinking too much on a single occasion can put your heart—and your life—at risk. On the other hand, researchers now understand that drinking moderate amounts of alcohol can protect the hearts of some people from the risks of coronary artery disease.

Deciding how much, if any, alcohol is right for you can be complicated. To make the best decision for yourself, you need to know the facts and then consult your physician.

Know the Benefits

Research shows that healthy people who drink moderate amounts of alcohol may have a lower risk of developing coronary heart disease than nondrinkers. Moderate drinking is usually defined as no more than two drinks in a given day for men and one drink per day for women who are not pregnant or trying to conceive.

A variety of factors, including diet, genetics, high blood pressure, and age, can cause fat to build up in your arteries, resulting in coronary heart disease. An excess of fat narrows the coronary arteries, which are the blood vessels that supply blood directly to the heart.

Clogged arteries reduce blood supply to the heart muscle, and make it easier for blood clots to form. Blood clots can lead to both heart attacks and strokes.

According to recent studies, drinking moderately can protect your heart from these conditions. Moderate drinking helps inhibit and reduce the build-up of fat in the arteries. It can raise the levels of HDL—or “good” cholesterol—in the blood, which wards off heart disease. It can help guard against heart attack and stroke by preventing blood clots from forming and by dissolving blood clots that do develop. Drinking moderately also may help keep blood pressure levels in check.

These benefits may not apply to people with existing medical conditions, or who regularly take certain medications. In addition, researchers discourage people from beginning to drink just for the health benefits. Rather, you can use this research to help you spark a conversation with your medical professional about the best path for you.

Cancer Risk

Genetics, environment, and lifestyle habits can all heighten your risk of getting cancer. We can't do anything to change our genes, and we often can't do much to change our environment. But lifestyle habits are a different story.

Drinking too much alcohol is one lifestyle habit that can increase your risk of developing certain cancers. This does not mean that anyone who drinks too much will develop cancer. But numerous studies do show the more you drink, the more you increase your chances of developing certain types of cancer.

For example, a group of Italy-based scientists reviewed more than 200 studies examining alcohol's impact on cancer risk. The collective results of these studies clearly demonstrate that the more you drink, the higher your risk for developing a variety of cancers. The National Cancer Institute identifies alcohol as a risk factor for the following types of cancer:

- Mouth
- Esophagus
- Pharynx
- Larynx
- Liver
- Breast

At least 7 out of 10 people with mouth cancer drink heavily. Drinking five or more drinks per day can also increase your risk of developing other types of cancers, including colon or rectal cancer. In fact, summary estimates from the recent World Cancer Research Fund report indicate that women who drink five standard alcohol drinks each day have about 1.2 times the risk of developing colon or rectal cancer than women who do not drink at all. People who drink are also more likely to smoke, and the combination increases the risk significantly. Smoking alone is a known risk factor for some cancers. But smoking and drinking together intensifies the cancer-causing properties of each substance. The overall effect poses an even greater risk.

The risk of throat and mouth cancers is especially high because alcohol and tobacco both come in direct contact with those areas. Overall, people who drink and smoke are 15 times more likely to develop cancers of the mouth and throat than nondrinkers and nonsmokers. In addition, recent studies estimate that alcohol and tobacco together are responsible for:

- 80 percent of *throat and mouth cancer* in men
- 65 percent of throat and mouth cancer in women
- 80 percent of *esophageal squamous cell carcinoma*, a type of esophagus cancer
- 25 to 30 percent of all liver cancers

Section 8.5 Tobacco

The 30th tobacco-related Surgeon General's report issued since 1964 describes in detail the specific pathways by which tobacco smoke damages the human body. The scientific evidence supports the following conclusions:

There is no safe level of exposure to tobacco smoke.

- Any exposure to tobacco smoke – even an occasional cigarette or exposure to secondhand smoke – is harmful.
- You don't have to be a heavy smoker or a long-time smoker to get a smoking-related disease or have a heart attack or asthma attack that is triggered by tobacco smoke.
- Low levels of smoke exposure, including exposures to secondhand tobacco smoke, lead to a rapid and sharp increase in dysfunction and inflammation of the lining of the blood vessels, which are implicated in heart attacks and stroke.
- Cigarette smoke contains more than 7,000 chemicals and compounds. Hundreds are toxic and at least 69 cause cancer. Tobacco smoke itself is a known human carcinogen.

- Chemicals in tobacco smoke interfere with the functioning of fallopian tubes, increasing risk for adverse pregnancy outcomes such as ectopic pregnancy, miscarriage, and low birth weight. They also damage the DNA in sperm which might reduce fertility and harm fetal development.

Damage from tobacco smoke is immediate.

- The chemicals in tobacco smoke reach your lungs quickly every time you inhale. Your blood then carries the toxins to every organ in your body.
- The chemicals and toxicants in tobacco smoke damage DNA, which can lead to cancer. Nearly one-third of all cancer deaths every year are directly linked to smoking. Smoking causes about 85% of lung cancers in the U.S.
- Exposure to tobacco smoke quickly damages blood vessels throughout the body and makes blood more likely to clot. This damage can cause heart attacks, strokes, and even sudden death.
- The chemicals in tobacco smoke inflame the delicate lining of the lungs and can cause permanent damage that reduces the ability of the lungs to exchange air efficiently and leads to chronic obstructive pulmonary disease (COPD), which includes emphysema and chronic bronchitis.

Smoking longer means more damage.

- Both the risk and the severity of many diseases caused by smoking are directly related to how long the smoker has smoked and the number of cigarettes smoked per day.
- Chemicals in tobacco smoke cause inflammation and cell damage, and can weaken the immune system. The body makes white blood cells to respond to injuries, infections, and cancers. White blood cell counts stay high while smoking continues, meaning the body is constantly fighting against the damage caused by smoking which can lead to disease in almost any part of the body.
- Smoking can cause cancer and weaken your body's ability to fight cancer. With any cancer – even those not related to tobacco use – smoking can decrease the benefits of chemotherapy and other cancer treatments. Exposure to tobacco smoke can help tumors grow.
- The chemicals in tobacco smoke complicate the regulation of blood sugar levels, exacerbating the health issues resulting from diabetes. Smokers with diabetes have a higher risk of heart and kidney disease, amputation, eye disease causing blindness, nerve damage and poor circulation.

Cigarettes are designed for addiction.

- The design and contents of tobacco products make them more attractive and addictive than ever before. Cigarettes today deliver nicotine more quickly from the lungs to the heart and brain.
- The powerful addicting elements of tobacco products affect multiple types of nicotine receptors in the brain.
- Evidence suggests that psychosocial, biologic, and genetic factors may also play a role in nicotine addiction.

There is no safe cigarette.

- The evidence indicates that changing cigarette designs over the last five decades, including filtered, low-tar, and “light” variations, have NOT reduced overall disease risk among smokers and may have hindered prevention and cessation efforts.
- The overall health of the public could be harmed if the introduction of novel tobacco products encourages tobacco use among people who would otherwise be unlikely to use a tobacco product or delays cessation among persons who would otherwise quit using tobacco altogether.

Quitting

The only proven strategy for reducing the risk of tobacco-related disease and death is to never smoke, and if you do smoke to quit.

Quitting at any age and at any time is beneficial. It's never too late to quit, but the sooner the better. Quitting gives your body a chance to heal the damage caused by smoking. When smokers quit, the risk for a heart attack drops sharply after just 1 year; stroke risk can fall to about the same as a nonsmoker's after 2-5 years; risks for cancer of the mouth, throat, esophagus, and bladder are cut in half after 5 years; and the risk for dying of lung cancer drops by half after 10 years. Smokers often make several attempts before they are able to quit, but new strategies for cessation, including nicotine replacement and non-nicotine medications, can make it easier.

Tobacco smoke is a toxic mix of more than 7,000 chemicals. Many are poisons. When these chemicals get deep into your body's tissues, they cause damage. Your body must fight to heal the damage each time you smoke. Over time, the damage can lead to disease.

The chemicals in tobacco smoke reach your lungs quickly when you inhale. What this new report shows is that *these same poisonous chemicals reach every organ in your body*. They go quickly from your lungs into your blood. Then the blood flows through your arteries. It carries the chemicals to tissues in all parts of your body. Your lungs, blood vessels, and other delicate tissues become inflamed and damaged when you smoke.

Smoking Keeps Your Body under Attack

If you spilled drain cleaner on your skin, it would hurt and become inflamed. If you did this many times a day, your skin would not have a chance to heal. It would stay red, irritated, and inflamed. The organs in your body also have a lining of cells similar to skin. Chemicals in tobacco smoke cause inflammation and damage to these cells. When you keep smoking, the damage cannot heal.

Smoking makes your immune system work overtime. Your body makes white blood cells to respond to injuries, infections, and even cancers. Blood tests show that your white blood cell numbers stay high when you smoke. High numbers mean that your body is constantly fighting against the damage caused by tobacco smoke. This constant stress disrupts how your body works. New research shows that stress can lead to disease in almost any part of your body.

Damage is Immediate.

The poisons in smoke pose a danger right away. Sudden blood clots, heart attacks, and strokes can be triggered by tobacco smoke. Poisons in tobacco smoke disrupt the way your body heals itself. Even smoking a cigarette now and then is enough to hurt you. Sitting in a

smoky bar raises your odds of a heart attack.

The more years you smoke, the more you hurt your body. Scientists now know that your disease risk surges even higher after you have smoked for about 20 years. But research shows that if you quit by age 30, your health could become almost as good as a nonsmoker's. At any age, the sooner you quit, the sooner your body can begin to heal.

Nicotine is powerfully addictive.

Addiction to nicotine changes the chemical balance in your brain. Addiction keeps people smoking even when they want to quit. Breaking addiction is harder for some people than others. Many people need more than one try in order to quit.

Scientists now know more about why the brain craves nicotine. Like heroin or cocaine, nicotine changes the way your brain works and causes you to crave more and more nicotine. These powerful cravings make it hard for you to think about anything else. Smoking can cause both physical and mental addiction.

Cigarettes are designed for addiction.

Cigarette makers have long known that nicotine addiction helps sell their products.

Cigarettes today deliver more nicotine and deliver it quicker than ever before. The additives and chemicals that tobacco companies put in cigarettes may have helped make them.

You might have thought that "filtered," "low-tar," or "light" cigarettes were less dangerous than others. But research shows that these cigarettes are every bit as addictive and are no safer than other cigarettes. Misleading labels are no longer allowed.

Many teens who try cigarettes don't know how easy it is to become addicted. Nicotine addiction is so powerful that every day about 1,000 teens become daily smokers. Why is this important? Because most current smokers became addicted as teenagers.

You can beat addiction to tobacco.

Smokers who quit go through withdrawal. The first days are the most uncomfortable. The physical symptoms of nicotine addiction end about 3 weeks after you quit smoking. But you may still have an urge to smoke when you wake up, drink coffee, or are out with friends. It takes longer to break these patterns. But you can beat it.

Section 8.6 Myths about Smoking and Cigarettes

Smoking is just a choice.

The first time? Yes. After just a few cigarettes? No. Addiction to nicotine can happen quickly. It changes the chemical balance in your brain. Smoking may seem like it's just a choice or a habit. In fact, most people who use tobacco are addicted. Breaking nicotine addiction is harder for some people than others. Quitting can take several tries. But don't give up. If you need help to quit, ask your doctor about nicotine replacement medicines, or

coaching.

Filters make cigarettes safer.

Filters do not protect you. They are designed to make smoke particles smaller. That makes nicotine easier to absorb. This increases addiction. Cigarettes have been engineered to speed up nicotine's path to your brain. Their design feeds addiction. Light or low-tar cigarettes may sound less dangerous. They aren't. These misleading labels are no longer allowed. No cigarette is safe. Tobacco smoke contains more than 7,000 chemicals. At least 250 are toxic.

An occasional cigarette is no big deal.

Smoking doesn't just cause diseases for heavy smokers or longtime smokers. The 2010 Surgeon General's Report shows how breathing tobacco smoke can cause immediate harm. Tobacco smoke can trigger sudden heart attacks and death, even in nonsmokers. Each cigarette you smoke hurts your lungs, your blood vessels, and cells throughout your body. Smoking a few cigarettes a week can cause a heart attack. Cutting back is not enough to protect you. You have to quit entirely.

It's too late to quit—the damage is already done.

It's true that the longer you use tobacco, the more you hurt your body. But at any age, the sooner you quit, the sooner your health can improve. The 2010 Surgeon General's Report shows how using tobacco causes disease almost everywhere in your body. Within 20 minutes after quitting, your body starts to heal. After 2 to 5 years, your risk for stroke is similar to that of a nonsmoker. In 10 years, your lung cancer risk is cut in half.

Secondhand smoke may bother people, but it isn't dangerous.

Tens of thousands of nonsmokers die every year from breathing others' secondhand smoke. Breathing the chemicals in tobacco smoke changes your blood's chemistry almost immediately. Deadly clots can form and block arteries to your heart or brain. When you smoke at work, home, or at a restaurant, everyone there breathes poisons. If you smoke in your car, rolling down a window does not protect your passengers. It is not healthy to breathe any amount of tobacco smoke.

The little bit of smoke that my kids get doesn't hurt them.

Don't smoke or let others smoke around your children. They can get bronchitis, pneumonia, and ear infections from smoke. Even if you only smoke by an open window, some of the smoke stays in your house and poisons the air your children breathe. Children with asthma can have a serious, even deadly, asthma attack from breathing secondhand smoke. The best way to protect children is to quit smoking. If you or someone else in your household are not ready to quit, be sure to make your home and car 100% smoke-free.

Section 8.7 Drug Addiction

More than three decades of research supported by the National Institute on Drug Abuse (NIDA) has proven that addiction is a complex brain disease characterized by compulsive, at times uncontrollable, drug craving, seeking, and use that persist despite potentially devastating consequences. Addiction is also a developmental disease; that is, it usually starts in adolescence or even childhood and can last a lifetime if untreated. Disagreements about the nature of addiction remain: namely, whether it reflects voluntary or involuntary behavior and whether it should be punished or treated as a health issue. Even though the first time a person takes a drug, it is often by choice—to achieve a pleasurable sensation or desired emotional state—we now know from a large body of research that this ability to choose can be affected by drugs. And when addiction takes hold in the brain, it disrupts a person's ability to exert control over behavior—reflecting the compulsive nature of this disease.

The human brain is an extraordinarily complex and fine-tuned communications network made up of billions of cells that govern our thoughts, emotions, perceptions, and drives. Our brains reward certain behaviors such as eating or procreating—registering these as pleasurable activities that we want to repeat. Drug addiction taps into these vital mechanisms geared for our survival. And although not a life necessity, to an addicted person, drugs become life itself, driving the compulsive use of drugs—even in the face of dire life consequences—*that is the essence of addiction*.

How Does Addiction Take Hold in the Brain?

The rewarding effects of drugs of abuse come from large and rapid surges in dopamine, a neurochemical critical to stimulating feelings of pleasure and to motivating behavior. The rapid dopamine “rush” from drugs of abuse mimics but greatly exceeds in intensity and duration the feelings that occur in response to such pleasurable stimuli as the sight or smell of food, for example. Repeated exposure to large, drug-induced dopamine surges has the insidious consequence of ultimately blunting the response of the dopamine system to everyday stimuli. Thus the drug disturbs a person's normal hierarchy of needs and desires and substitutes new priorities concerned with procuring and using the drug.

Drug abuse also disrupts the brain circuits involved in memory and control over behavior. Memories of the drug experience can trigger craving as can exposure to people, places, or things associated with former drug use. Stress is also a powerful trigger for craving. Control over behavior is compromised because the affected frontal brain regions are what a person needs to exert inhibitory control over desires and emotions.

That is why addiction is a brain disease. As a person's reward circuitry becomes increasingly dulled and desensitized by drugs, nothing else can compete with them—food, family, and friends lose their relative value, while the ability to curb the need to seek and use drugs evaporates. Ironically and cruelly, eventually even the drug loses its ability to reward, but the compromised brain leads addicted people to pursue it, anyway; the memory of the drug has become more powerful than the drug itself.

When does drug abuse become drug addiction? It rarely happens with the first use of a drug. Drug abuse and drug addiction can be thought of as points along a continuum. Any use of a mind-altering drug or the inappropriate use of medication (either prescription or over-the-counter drugs) is **drug abuse**, but the point when drug abuse becomes drug addiction is less clear. Different people may reach the point of addiction at different stages. Scientists continue to investigate the factors that contribute to the transition to drug addiction.

Drug addiction is defined as the continued compulsive use of drugs despite adverse health or social consequences. Drug-addicted people have lost control of their drug use. Individuals who are addicted to drugs often become isolated from family or friends, have difficulty at work or school, may commit crimes, and become involved with the criminal justice system. For a person addicted to drugs, continuing to take them becomes the primary focus in life.

Certain drugs, including opioids and alcohol, cause strong physical reactions in the body when drug use stops. When a person addicted to heroin stops taking heroin, he or she can experience a variety of symptoms ranging from watery eyes and a runny nose to irritability and loss of appetite and then diarrhea, shivering, sweating, abdominal cramps, increased sensitivity to pain, and sleep problems. In general, withdrawal from heroin makes people feel miserable. Withdrawal from alcohol can cause serious effects such as seizures and even death. Withdrawal from other drugs, such as cocaine and amphetamines, does not lead to strong physical reactions, but it may make the person feel depressed or lethargic. For most drugs, physical withdrawal symptoms can usually be controlled effectively with medications. Even though withdrawal from some drugs does not cause the person abusing them to have physical reactions, stopping drug use is difficult because of the changes the drugs have caused in the brain. Once the drugs stop, the person will have **cravings**, or intense desire for the drugs. Craving arises from the brain's need to maintain a state of homeostasis that now relies on the presence of the drug. A person may experience cravings at any stage of drug abuse or addiction, even early in the experimentation phase of drug abuse. Cravings have a physical basis in the brain. Using PET imaging, scientists have shown that just seeing images of drug paraphernalia can stimulate the amygdala (part of the brain involved in emotional memory) in an addicted person.

Drugs of addiction do not merely cause short-term changes in an individual's cognitive skill and behavior. A drug "high" lasts a short time, ranging from less than an hour to 12 hours, depending on the drug, dose, and route of administration. The changes in the brain that result from continued drug use, however, can last a long time. Scientists believe that some

of these changes disappear when drug use stops; some disappear within a short time after drug use stops, and other changes are potentially permanent.

One of the first changes in the brain that may occur in response to repeated drug abuse is tolerance. **Tolerance** develops when a person needs increasing doses of a drug to achieve the same high or “rush” that previously resulted from a lower dose of the drug. Two primary mechanisms underlie the development of tolerance. First, the body may become more efficient at metabolizing the drug, thereby reducing the amount that enters the brain. Second, the cells of the body and brain may become more resistant to the effect of the drug. For example, after continued cocaine use, neurons decrease the number of dopamine receptors, which results in decreasing cocaine’s stimulatory effect. Opioids, on the other hand, do not cause a change in the number of receptors. Instead the opioid receptors become less efficient in activating associated cellular processes, thus reducing the effects of the opioids.

In addition to the functional and anatomical changes in the brain, drug abuse puts people at higher risk for other health problems. For example, inhalant abuse can lead to disruption of heart rhythms, and snorting cocaine can lead to ulcerations in the mucous membranes of the nose. In addition, injection drug users (IDUs) are at higher risk of contracting HIV through the sharing of potentially contaminated needles. Similarly, hepatitis B and hepatitis C are much more common among drug addicts than the general population. Tuberculosis is another concern. Drug abuse and addiction also are contributing factors in motor vehicle accidents.

Why Do Some People Become Addicted While Others Do Not?

No single factor can predict whether a person will become addicted to drugs. Risk for addiction is influenced by a combination of factors that include individual biology, social environment, and age or stage of development. The more risk factors an individual has, the greater the chance that taking drugs can lead to addiction.

For example:

Biology. The genes that people are born with—in combination with environmental influences—account for about half of their addiction vulnerability. Additionally, gender, ethnicity, and the presence of other mental disorders may influence risk for drug abuse and addiction.

Environment. A person’s environment includes many different influences, from family and friends to socioeconomic status and quality of life in general. Factors such as peer pressure, physical and sexual abuse, stress, and quality of parenting can greatly influence the occurrence of drug abuse and the escalation to addiction in a person’s life.

Development. Genetic and environmental factors interact with critical developmental stages in a person’s life to affect addiction vulnerability. Although taking drugs at any age can lead to addiction, the earlier that drug use begins, the more likely it will progress to more serious abuse, which poses a special challenge to adolescents. Because their brains are still developing in the areas that govern decisionmaking, judgment, and self-control, adolescents may be especially prone to risk-taking behaviors, including trying drugs of abuse.

Prevention Is the Key

Drug addiction is a preventable disease. Results from NIDA-funded research have shown that prevention programs involving families, schools, communities, and the media are effective in reducing drug abuse. Although many events and cultural factors affect drug abuse trends, when youths perceive drug abuse as harmful, they reduce their drug taking. Thus, education and outreach are key in helping youth and the general public understand the risks of drug abuse. Teachers, parents, medical and public health professionals must keep sending the message that drug addiction can be prevented if one never abuses drugs.

Section 8. 7 Treatment Approaches for Drug Addiction

Can drug addiction be treated?

Yes, but it's not simple. Because addiction is a chronic disease, people can't simply stop using drugs for a few days and be cured. Most patients need long-term or repeated care to stop using completely and recover their lives.

Addiction treatment must help the person do the following:

- stop using drugs
- stay drug-free
- be productive in the family, at work, and in society

Principles of Effective Treatment

Based on scientific research since the mid-1970s, the following key principles should form the basis of any effective treatment program:

- Addiction is a complex but treatable disease that affects brain function and behavior.
- No single treatment is right for everyone.
- People need to have quick access to treatment.
- Effective treatment addresses all of the patient's needs, not just his or her drug use.
- Staying in treatment long enough is critical.
- Counseling and other behavioral therapies are the most commonly used forms of treatment.
- Medications are often an important part of treatment, especially when combined with behavioral therapies.
- Treatment plans must be reviewed often and modified to fit the patient's changing needs.

- Treatment should address other possible mental disorders.
- Medically assisted detoxification is only the first stage of treatment.
- Treatment doesn't need to be voluntary to be effective.
- Drug use during treatment must be monitored continuously.
- Treatment programs should test patients for HIV/AIDS, hepatitis B and C, tuberculosis, and other infectious diseases as well as teach them about steps they can take to reduce their risk of these illnesses.

How is drug addiction treated?

Successful treatment has several steps:

- detoxification (the process by which the body rids itself of a drug)
- behavioral counseling
- medication (for opioid, tobacco, or alcohol addiction)
- evaluation and treatment for co-occurring mental health issues such as depression and anxiety
- long-term follow-up to prevent relapse

A range of care with a tailored treatment program and follow-up options can be crucial to success. Treatment should include both medical and mental health services as needed.

Follow-up care may include community- or family-based recovery support systems.

How are medications used in drug addiction treatment?

Medications can be used to manage withdrawal symptoms, prevent relapse, and treat co-occurring conditions.

Withdrawal: Medications help suppress withdrawal symptoms during detoxification. Detoxification is not in itself “treatment,” but only the first step in the process. Patients who do not receive any further treatment after detoxification usually resume their drug use. One study of treatment facilities found that medications were used in almost 80 percent of detoxifications (SAMHSA, 2014).

Relapse prevention: Patients can use medications to help re-establish normal brain function and decrease cravings. Medications are available for treatment of opioid (heroin, prescription pain relievers), tobacco (nicotine), and alcohol addiction. Scientists are developing other medications to treat stimulant (cocaine, methamphetamine) and cannabis (marijuana) addiction. People who use more than one drug, which is very common, need treatment for all of the substances they use.

- **Opioids:** Methadone (Dolophine®, Methadose®), buprenorphine (Suboxone®, Subutex®, Probuphine®), and naltrexone (Vivitrol®) are used to treat opioid addiction. Acting on the same targets in the brain as heroin and morphine, methadone and buprenorphine suppress withdrawal symptoms and relieve cravings. Naltrexone blocks the effects of opioids at their receptor sites in the brain

and should be used only in patients who have already been detoxified. All medications help patients reduce drug seeking and related criminal behavior and help them become more open to behavioral treatments.

- **Tobacco:** Nicotine replacement therapies have several forms, including the patch, spray, gum, and lozenges. These products are available over the counter. The U.S. Food and Drug Administration (FDA) has approved two prescription medications for nicotine addiction: bupropion (Zyban®) and varenicline (Chantix®). They work differently in the brain, but both help prevent relapse in people trying to quit. The medications are more effective when combined with behavioral treatments, such as group and individual therapy as well as telephone quitlines.
- **Alcohol:** Three medications have been FDA-approved for treating alcohol addiction and a fourth, topiramate, has shown promise in clinical trials (large-scale studies with people). The three approved medications are as follows:
 - **Naltrexone** blocks opioid receptors that are involved in the rewarding effects of drinking and in the craving for alcohol. It reduces relapse to heavy drinking and is highly effective in some patients. Genetic differences may affect how well the drug works in certain patients.
 - **Acamprosate (Campral®)** may reduce symptoms of long-lasting withdrawal, such as insomnia, anxiety, restlessness, and dysphoria (generally feeling unwell or unhappy). It may be more effective in patients with severe addiction.
 - **Disulfiram (Antabuse®)** interferes with the breakdown of alcohol. Acetaldehyde builds up in the body, leading to unpleasant reactions that include flushing (warmth and redness in the face), nausea, and irregular heartbeat if the patient drinks alcohol. Compliance (taking the drug as prescribed) can be a problem, but it may help patients who are highly motivated to quit drinking.
- **Co-occurring conditions:** Other medications are available to treat possible mental health conditions, such as depression or anxiety, that may be contributing to the person's addiction.



Figure 1. Wheel of drug addiction treatments

How are behavioral therapies used to treat drug addiction?

Behavioral therapies help patients:

- modify their attitudes and behaviors related to drug use
- increase healthy life skills
- persist with other forms of treatment, such as medication

Patients can receive treatment in many different settings with various approaches.

Outpatient behavioral treatment includes a wide variety of programs for patients who visit a behavioral health counselor on a regular schedule. Most of the programs involve individual or group drug counseling, or both. These programs typically offer forms of behavioral therapy such as:

- *cognitive-behavioral therapy*, which helps patients recognize, avoid, and cope with the situations in which they are most likely to use drugs
- *multidimensional family therapy*—developed for adolescents with drug abuse problems as well as their families—which addresses a range of influences on their drug abuse patterns and is designed to improve overall family functioning

- *motivational interviewing*, which makes the most of people's readiness to change their behavior and enter treatment
- *motivational incentives* (contingency management), which uses positive reinforcement to encourage abstinence from drugs

Treatment is sometimes intensive at first, where patients attend multiple outpatient sessions each week. After completing intensive treatment, patients transition to regular outpatient treatment, which meets less often and for fewer hours per week to help sustain their recovery.

Inpatient or residential treatment can also be very effective, especially for those with more severe problems (including co-occurring disorders). Licensed residential treatment facilities offer 24-hour structured and intensive care, including safe housing and medical attention. Residential treatment facilities may use a variety of therapeutic approaches, and they are generally aimed at helping the patient live a drug-free, crime-free lifestyle after treatment.

POINTS TO REMEMBER

Drug addiction can be treated, but it's not simple. Addiction treatment must help the person do the following:

- stop using drugs
- stay drug-free
- be productive in the family, at work, and in society

Successful treatment has several steps:

- detoxification
- behavioral counseling
- medication (for opioid, tobacco, or alcohol addiction)
- evaluation and treatment for co-occurring mental health issues such as depression and anxiety
- long-term follow-up to prevent relapse

Medications can be used to manage withdrawal symptoms, prevent relapse, and treat co-occurring conditions.

- Behavioral therapies help patients:
- modify their attitudes and behaviors related to drug use
- increase healthy life skills
- persist with other forms of treatment, such as medication
- People within the criminal justice system may need additional treatment services to treat drug use disorders effectively. However, many offenders don't have access to the types of services they need

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CHAPTER 9: Basic Nutrition and Healthy Eating

The word nutrition first appeared in 1551 and comes from the Latin word *nutrire*, meaning “to nourish.” Today, we define **nutrition** as the sum of all processes involved in how organisms obtain nutrients, metabolize them, and use them to support all of life’s processes. **Nutritional science** is the investigation of how an organism is nourished, and incorporates the study of how nourishment affects personal health, population health, and planetary health. Nutritional science covers a wide spectrum of disciplines. As a result, nutritional scientists can specialize in particular aspects of nutrition such as biology, physiology, immunology, biochemistry, education, psychology, sustainability, and sociology.

Without adequate nutrition the human body does not function optimally, and severe nutritional inadequacy can lead to disease and even death. The typical American diet is lacking in many ways, from not containing the proper amounts of essential nutrients, to being too speedily consumed, to being only meagerly satisfying.

Section 9.1 Nutrition and Health

The foods we eat affect all dimensions of health and wellness. For example, a teen with Type 2 diabetes (a disease brought on by poor diet) is first diagnosed by physical signs and symptoms such as increased urination, thirstiness, and unexplained weight loss. But research has also found that teens with Type 2 diabetes have impaired thinking and do not interact well with others in school, thereby affecting psychological and social well-being. Type 2 diabetes is just one example of a physiological disease that affects multiple dimensions of health—physical, psychological, and social.

Public Health and Disease Prevention

In 1894, the first congressional funds were appropriated to the US Department of Agriculture (USDA) for the study of the relationship between nutrition and human health. Dr. Wilbur Olin Atwater was appointed as the Chief of Nutrition Investigations and is acclaimed as the “Father of Nutrition Science” in America. Combs, G.F. “Celebration of the Past: Nutrition at USDA.” *J Nutr* 124, no. 9 supplement (1994): 1728S–32S.

Under his guidance, the USDA released the first bulletin to the American public that contained information on the amounts of fat, carbohydrates, proteins, and food energy (calories) in various foods. Nutritional science advanced considerably in these early years, but it took until 1980 for the USDA and the US Department of Health and Human Services (HHS) to jointly release the first edition of *Nutrition and Your Health: Dietary Guidelines for Americans*. Although wide distribution of dietary guidelines did not come about until the 1980s, many historical events that demonstrated the importance of diet to health preceded their release. Assessments of the American diet in the 1930s led President Franklin D. Roosevelt to declare in his inaugural address on January 20, 1937, “I see one-third of our nation is ill-housed, ill-clad, and ill-nourished.” From the time of Atwater until the onset of the Great Depression nutritional scientists had discovered many of the vitamins and

minerals essential for the functioning of the human body. Their work and the acknowledgement by President FDR of the nutritional inadequacy of the American diet evoked a united response between scientists and government leading to the enrichment of flour, the development of school lunch programs, and advancements of nutritional education in this country.

In the latter part of the twentieth century nutritional scientists, public health organizations, and the American public increasingly recognized that eating too much of certain foods is linked to chronic diseases. We now know that diet-related conditions and diseases include hypertension (high blood pressure), obesity, Type 2 diabetes, cardiovascular disease, some cancers, and osteoporosis. These diet-related conditions and diseases are some of the biggest killers of Americans. The HHS reports that unhealthy diets and inactivity cause between 310,000 and 580,000 deaths every single year.

Calories

As previously stated, many of the health issues associated with poor eating habits are a result of an energy imbalance. Most Americans are obtaining more energy from food than they actually need to function in their daily lives. With a large percentage of Americans engaging in no physical activity, this excess of energy is stored as fat in the body. This food energy is measured in calories, also known as kilocalories (kcals). A kilocalorie is the amount of energy needed to raise 1 kilogram of water 1 degree Celsius, but food labels use the term calorie to describe the amount of energy in the individual foods described. The term calorie is used in this textbook to describe food energy.

Nutrients

Ideally, when we consume and obtain energy from our food, we will primarily eat nutrient dense foods. A nutrient is a compound that provides a needed function in the body. Nutrients can be further classified based on the amount needed in the body. The six Essential Nutrients are the nutrients that our bodies need in order to survive. They can be broken into two categories: macronutrients and micronutrients.

Macronutrients are nutrients needed in larger amounts. There are four macronutrients which include:

- Carbohydrates: 4 calories per gram
- Fats (lipids): 9 calories per gram
- Protein: 4 calories per gram
- Water: contains 0 calories

Note: As can be seen, carbohydrates, protein, and fats provide energy. However, there is another energy source in the diet that is not a nutrient- alcohol.

Alcohol is NOT a nutrient! But it does provide energy. Alcohol has 7 calories per gram.

Micronutrients are nutrients needed in smaller amounts, but they are still considered essential. There are two groups of micronutrients which are:

- Vitamins
- Minerals

Carbohydrates

Carbohydrates are a diverse group of compounds that have a multitude of effects in the body and are the primary form of energy for activities of daily living. The name carbohydrate means “hydrated carbon” or carbon with water. Thus, it isn’t a surprise that carbohydrates are made up of carbon, hydrogen, and oxygen. Sucrose (table sugar) is an example of a commonly consumed carbohydrate. Although grains and starchy foods are most often associated with carbohydrates, almost all foods do contain some carbohydrates. Some dietary examples of carbohydrate rich foods are whole-wheat bread, oatmeal, rice, sugary snacks/drinks, and pasta. There are many different types of carbohydrates, but the three main types are: simple, complex, and alternative sugar sweeteners.

Simple Carbohydrates

Simple carbohydrates contain one molecule called monosaccharides, and double molecules are called disaccharides.

Monosaccharides

Monosaccharides are: glucose (a major source of energy in our bodies), fructose (commonly found in fruits and used commercially in many beverages), and galactose (not normally found in nature alone but found in the disaccharide called lactose).

Monosaccharides are sweet foods such as honey and cane sugar. Other foods that contain simple sugars are dairy products, beans, and fruit.

Disaccharides

Disaccharides are: sucrose (table sugar), lactose (milk sugar), maltose (malt sugar).

Disaccharides are in beverages and baked goods. They are refined for making brown sugar, powdered sugar, and molasses. Lactose is in dairy products such as cheese, yogurt, and ice cream. Maltose is found in beer and some breads and grains.

Food manufacturers are always searching for cheaper ways to produce their food. One method that has been popular is the use of high-fructose corn syrup as an alternative to sucrose (table sugar). High-fructose corn syrup contains 55% fructose which is similar to sucrose. Nevertheless, because an increase in high-fructose corn syrup consumption has coincided with the increase of obesity in the US, there is a lot of controversy surrounding its use. In reading labels, one will usually see high-fructose corn syrup plus other sugars listed which could be adding to the obesity epidemic.

Complex Carbohydrates

Complex Carbohydrates contain many sugar molecules while simple carbohydrates contain only one or two sugars. Complex Carbohydrates are called polysaccharides. Poly means “many,” and thus polysaccharides are made of more than 10 sugar molecules.

(Monosaccharides are the simplest forms of sugar meaning one molecule.) There are three classes of polysaccharides: starch, glycogen, and most fibers.

Starch

Starch is the storage form of glucose in plants. Glucose is a single sugar used in both plant and animal tissues for energy. It is the main source of fuel for the cells. After cooking, starch

becomes digestible for humans. Raw starch may resist digestion. Examples of starch foods are corn, potatoes, rice, beans, pasta, and grains.

Glycogen

Glycogen is made up of many glucose units (single sugar). It is made and stored by the liver and muscle tissues of humans. It is not considered a complex carbohydrate in foods.

Fiber

Fiber is indigestible matter that survives digestion in the small intestine and then reaches the large intestine. It is divided into two categories: soluble and insoluble. Soluble means it can be dissolved in water, and insoluble means it does not dissolve in water.

- ***Soluble fibers are fermentable fibers. It is believed that these fibers decrease blood cholesterol and sugar levels thus lowering the risk of heart disease and diabetes II.***
- ***Insoluble fibers are non-fermentable, and it is believed that this type of fiber decreases the risk of constipation and colon cancer because it increases stool bulk and reduces transit time. This reduced transit time means shorter exposure to consumed carcinogens in the intestine which may lower cancer risk.***

The goal for a day's fiber intake is 25-40 grams depending on one's caloric intake. Suggestions would be to buy high fiber foods. Read the Nutrition Facts' label for how much fiber is in the product for one serving. Drink lots of fluids when eating fiber. Try to eat a minimum of five plant foods for fiber each day.

Alternative Sweeteners

Alternative sweeteners are simply alternatives to sucrose (table sugar) and other monosaccharides and disaccharides that provide sweetness. There are basically two categories: sugar alcohol and commonly used alternative sweeteners.

Sugar alcohol

Sugar alcohol can provide some calories but do not contribute to tooth decay. Sugar alcohols are also known as "sugar replacers." Some people get confused by the name sugar alcohol thinking it is a sweet alcoholic beverage. It is not alcohol. Another name for sugar alcohols is a nutritive sweetener. Sugar alcohols are almost as sweet as sucrose (table sugar) but only provide approximately half the calories.

The major advantage of sugar alcohols over sucrose is that sugar alcohols are not fermented by bacteria on the tooth surface which causes less tooth decay. Sugar alcohols are listed on the Nutrition Facts' label.

Other Alternative Sweeteners

Other Alternative Sweeteners have been developed to provide zero-calorie or low-calorie sweetening for foods and drinks. Because many of these provide little to no calories, these sweeteners are also referred to as non-nutritive sweeteners. (The FDA is using high-intensity sweeteners to describe these products.)

Fats (Lipids)

Lipids, commonly referred to as fats, have a poor reputation among most people. "Fat free" labeling on packaging is often perceived as healthy. We do need to consume certain fats,

and we should try to incorporate these fats into our diets for their health benefits. However, consumption of certain fats is also associated with a greater risk of developing chronic disease(s). There are different categories of lipids:

- Triglycerides
- Oils
- Cholesterol

These compounds are grouped together because of their structural and physical similarities. All lipids are insoluble in water, are oily to the touch, and together with carbohydrates and proteins constitute the principal structural material of the body.

Triglycerides

Triglycerides (triacylglycerols or TAG's) are molecules made of glycerol and fatty acids. They are the major form of energy storage in animals. Saturated fatty acids have higher melting point than unsaturated fatty acids because they are more dense (they have more hydrogen and fewer double bonds). Animal fats usually contain more saturated fatty acids than do vegetable oils. Therefore the melting points of animal fats are higher than those of vegetable oils.

Triglycerides are the most common lipid in our bodies and in the foods we consume. Fatty acids are not typically found free in nature; instead they are found in triglycerides.

Breaking down the name triglyceride tells a lot about its structure. "Tri" refers the three fatty acids; "glyceride" refers to the glycerol backbone that the 3 fatty acids are bonded to.

Triglycerides perform the following functions in our bodies:

- Provide energy
- Primary form of energy storage in the body
- Insulate and protect
- Aid in the absorption and transport of fat-soluble vitamins.

Structures of Fatty Acids

Fatty acids are components of triglycerides. They are like the brick in a brick wall. Each individual brick is needed to make the overall wall. There are two basic types of fatty acids:

- saturated fatty acid
- unsaturated fatty acid

These molecules differ in structure and food sources. Saturated fats are typically found in animal products such as poultry, meat and dairy and are solid at room temperature.

Unsaturated fats are typically found in plants and vegetable oils and are liquid at room temperature. There are also monounsaturated fatty acids (MUFAs) and polyunsaturated fatty acids (PUFAs), which appear to have a healthy affect on cholesterol levels.

There are two essential fatty acids, which are:

- linoleic acid (omega-6)
- alpha-linolenic (omega-3)

These fatty acids are essential because the body cannot synthesize them. The essential fatty acids are critical to human health as they play important roles in every system of the body.

Good food sources of omega-6 include whole grains, fresh fruits and veggies, fish, olive oil, and garlic. Good food sources of omega-3 include flax seed, egg yolk, and chia seeds.

Trans-fatty acids

Trans-fatty acids – like Crisco- are hydrogenated vegetable oils. In an artificial chemical process hydrogen is added to natural vegetable oils to make them more solid at room temperature, and more heat resistant for cooking. Hydrogenated oils are more resistant to heat degradation. The body doesn't have an efficient process for using trans-fats, so they get stored for the long term. The U.S. Food and Drug Administration have determined that trans-fatty acids are no longer safe for human consumption and currently being removed from our food supply.

Food Sources of Fatty Acids

The figure below shows the fatty acid composition of certain oils and oil-based foods. As can be seen, most foods contain a mixture of fatty acids. Stick margarine is the only product in the figure that contains an appreciable amount of trans fatty acids. Corn, walnut, and soybean are rich sources of omega-6 polyunsaturated fatty acids while flax seed is fairly unique among plants in that it is a good source of omega-3 polyunsaturated fatty acids. Canola and olive oil are rich sources of monounsaturated fatty acids. Lard, palm oil, butter and coconut oil all contain a significant amount of saturated fatty acids.

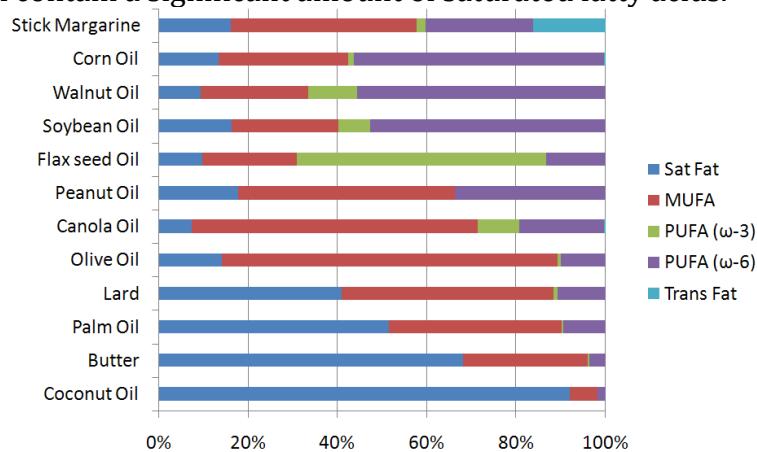


Figure 1. Different Types of Fat

Cholesterol

Cholesterol is a type of lipid found in the blood and in the diet. It has many functions and is a structural part of all body cells. It is an essential component of brain and nerve tissue. Cholesterol is needed to form hormones, bile, and vitamin D. Many foods contain cholesterol, but primarily it is found in foods of animal origin. Some meats are higher in cholesterol than others.

The body needs cholesterol, but it produces all of the cholesterol that it needs. It is almost impossible to avoid consuming outside sources of cholesterol, but it is possible and

advisable to limit cholesterol intake by avoiding foods high in cholesterol. Elevated levels of LDL in the blood can increase the risk of artery and heart disease.

The human body produces two types of cholesterol: low-density lipoprotein (LDL) and high-density lipoprotein (HDL).

LDL: The Bad Cholesterol

LDL is cholesterol that usually enters the human body through consuming food that contains cholesterol. LDL is considered the “bad cholesterol” because it bonds with triglycerides, another lipid, and stores it within the tissues. This is the leading cause of plaque in the arteries and can lead to restricted blood flow and possible cardiac arrest. This process takes place over several years with continuous eating of saturated fats, smoking, diabetes, and high blood pressure.



Figure 2. Blood flow restricted by the buildup of LDL cholesterol

Cholesterol plaque in the artery

HDL: The Good Cholesterol

HDL is produced when a person exercises, and it is considered the “good cholesterol.” HDL also bonds with triglycerides, but it is then processed by the body, added to feces, and expelled through the colon. In other words, HDL helps the body to process excess triglycerides thus managing the amount of excess fat in the overall system. The best way to increase HDL in the body is to exercise regularly.

Lipid Panel

A Lipid Panel is series of tests that measures the amount of cholesterol in the blood. A small sample of blood is drawn from the patient for this test. One number is for “total cholesterol.” This number will show the total fats in the blood. The HDL will show the good fats; LDL will show the bad fats; Triglycerides will show good or bad fats depending on the number above or below 150.

Adult Blood Cholesterol and Triglyceride Target Numbers:

- Total Cholesterol < 200 mg/dl
- Total HDL > 35
- Total LDL < 100

- Total Triglycerides < 150

Proteins

Proteins are another major macronutrient. They are similar to carbohydrates in that they are made up of small repeating units, but instead of sugars, proteins are made up of amino acids. Protein makes up approximately 20 percent of the human body and is present in every single cell. The word protein is a Greek word, meaning “of utmost importance.” Proteins are called the workhorses of life as they provide the body with structure and perform a vast array of functions. You can stand, walk, run, skate, swim, and more because of your protein-rich muscles. Protein is necessary for proper immune system function, digestion, and hair and nail growth, and is involved in numerous other body functions. In fact, it is estimated that more than one hundred thousand different proteins exist within the human body.

What Is Protein?

Proteins, simply put, are macromolecules composed of amino acids. **Amino acids** are commonly called protein’s building blocks. Proteins are crucial for the nourishment, renewal, and continuance of life. Proteins contain the elements carbon, hydrogen, and oxygen just as carbohydrates and lipids do, but proteins are the only macronutrient that contains nitrogen. In each amino acid the elements are arranged into a specific conformation around a carbon center. Each amino acid consists of a central carbon atom connected to a side chain, a hydrogen, a nitrogen-containing *amino* group, a carboxylic *acid* group—hence the name “amino acid.” Amino acids differ from each other by which specific side chain is bonded to the carbon center.

The functions of proteins are very diverse because there are 20 distinct amino acids that form long chains. For example, proteins can function as enzymes or hormones. Enzymes, one type of protein, are produced by living cells and are catalysts in biochemical reactions (like digestion). Enzymes can function to break molecular bonds, to rearrange bonds, or to form new bonds. An example of an enzyme is salivary amylase which breaks down amylose, a component of starch.

Amino Acids Function

Amino acids are combined in order to form all of the protein the human body needs. In fact, the body makes proteins itself, but it needs amino acids from food to construct proteins that the body uses. Antibodies, enzymes, muscle proteins, as well as proteins in the skin are all made up of amino acids, some that the body produces and some that must be consumed.

Non-Essential Amino Acids

Amino acids that the body produces are called non-essential amino acids. There are eleven non-essential amino acids: alanine, arginine, asparagine, aspartate, cysteine, glutamic acid, glutamine, glycine, proline, serine and tyrosine.

Essential Amino Acids

In Nutrition the term essential is used to name nutrients that the body doesn't produce itself; essential nutrients including essential amino acids must be consumed. There are nine essential amino acids: histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine.

Complete and Incomplete Proteins

As a way of simplifying protein, sources are described as either complete or incomplete. Complete proteins – such as eggs, tuna fish, peanut butter, almonds – contain most if not all of the essential amino acids. Incomplete proteins – such as spinach, beans, wheat germ – contain just a few of the essential amino acids.

Most plant-based proteins are categorized as incomplete proteins, but vegetarians should not be concerned about protein intake because a person can consume all of the essential amino acids by combining food sources. For example a person can eat beans and quinoa with a spinach salad and consume the essential amino acids.

Water

Water is made up of hydrogen and oxygen (H_2O) and is the only macronutrient that doesn't provide energy. Humans are 65% water! The body needs water to regulate temperature, moisten tissues in the mouth, eyes, and nose, lubricate joints, protect organs, prevent constipation, reduce the burden on kidneys and liver by helping to flush out waste, and to dissolve nutrients as part of the digestive process.

Although a person can survive for several weeks without food, the body cannot survive longer than a few days without fluids. A loss of water equivalent to:

- 1% of body weight is enough to cause thirst and to impact the ability to concentrate;
- 4% loss of hydration results in dizziness and reduced muscle power;
- 6% loss of fluids causes the heart to race and sweating ceases;
- 7% loss of hydration results in collapse and subsequent death if fluids are not replaced.

Water Intake

Table 1

Food	Water Content (%)
lettuce	95
carrots	90
boiled potatoes	80
grapes	80
lentil soup	78

grilled oily fish	65
cooked meats	60
potato chips	52
white bread	37
cheddar cheese	36
cake	15
semi-sweet cookies	2.5
cornflakes	3

In a normal diet, fluid is gained via food as well as in drinks. Along with water, most drinks such as tea, coffee, juices, and milk hydrate the body. However, alcoholic drinks may not contribute to body fluids as alcohol is a diuretic, a substance that increases the output of urine by the body. Caffeine, such as found in energy drinks, coffee, tea, and sodas, is also a diuretic. Caffeine has also been shown to have an impact on overall hydration, but significant amounts (300+ mg) are typically necessary to exhibit negative effects on the body.

The amounts of water in different foods vary.

- Water Content of Specific Foods

Water Loss

Fluid loss occurs in various ways throughout the body with urination being the primary method. While the elimination of the urine is periodic, the formation of urine constantly occurs. Urination not only removes excess water from the body but also rids the body of nitrogen-containing compounds and other wastes. A “typical” urine output is approximately 1.5 liters daily.

Perspiration (sweating) also removes fluid from the body. When body temperature rises, fluids are secreted through sweat glands to the surface of the skin. This fluid then evaporates which has a cooling effect and reduces overall body temperature. A typical loss of water through sweating is about 0.5 liters per day. With hot weather, exercise, or physical activity, water loss can increase to 2 liters per hour.

Because urine output and sweating are conscious and measurable methods of fluid loss, they are called “sensible” losses.

The body can also exhibit fluid losses in what are termed “insensible losses.” Insensible water loss is constantly occurring every minute of every day. These losses are neither consciously felt nor measureable. These include events such as breathing (our expelled breath contains moisture) and defecation (feces also contain water).

As can be seen by the above information, water intake and water loss should be balanced in order to prevent dehydration and to maintain a healthy body. The recommended daily **intake** is 10-13 cups of fluid from food and drink for adult males and 7-9 cups of fluid for adult females.

Vitamins

Vitamins are organic compounds that are essential for normal physiologic processes in the body. Before their detailed chemical structures were known, vitamins were named by being given a letter. They are generally still referred to by that letter as well as by their chemical name, for example, vitamin C or ascorbic acid.

Vitamins: Water-Soluble or Fat-Soluble

Vitamins are categorized as either water-soluble or fat-soluble based on how they are dissolved in the body. Water soluble vitamins are dissolved in water and absorbed during digestion. Excess water-soluble vitamins are excreted through urine. Fat-soluble vitamins are absorbed through the digestive process with the help of fats (lipids). Excess fat-soluble vitamins can build up in the body and become toxic. Vitamin supplements can be dangerous particularly with fat-soluble vitamins because people can overdose. A balanced diet includes all of the vitamins and minerals a person needs daily.

Water-Soluble Vitamins

There are nine water-soluble vitamins: Vitamin C, and eight Vitamin B's.

Fat-Soluble Vitamins

There are four fat-soluble vitamins: Vitamins A, D, E, and K.

Minerals

Minerals are essential, non-caloric nutrients that are in all of our food and are essential for normal physiologic processes in the body. Minerals are micronutrients, which means humans only need to eat them in small quantities. Minerals assist body functions that range from bone strength to regulating your heartbeat.

When plants take up the water through their roots, dissolved minerals from within the soil are absorbed by the plant. When people eat plants, they are likely ingesting minerals found in the plant. Animals are able to concentrate minerals in their tissues, so meats and other foods derived from animals often contain a higher concentration of minerals.

There are two categories of minerals: major minerals and trace minerals. The classification of a mineral as major or trace depends on how much of the mineral the body needs.

Major minerals include:

- Calcium
- Phosphorus
- Sodium
- Potassium
- Magnesium

Trace minerals include:

- Iron
- Fluoride

- Zinc
- Copper
- Iodine
- Manganese
- Chloride
- Selenium

Vitamin and Mineral Supplements

Vitamin and mineral supplements exist, but are not as effective as getting minerals from whole foods. There are two types of supplement: whole food supplements and synthetic supplements.

Whole food supplements are produced by taking vitamins and minerals straight from natural sources: soil, rocks, or plant/food sources; whereas, synthetic minerals are made in a lab. While synthetic mineral supplements mimic the chemical structure of vitamins and minerals, they are probably not exact copies. That means the body may not recognize the synthetic mineral structure and does not absorb the mineral efficiently. No supplements, including vitamins and minerals, are approved by the FDA. Only prescription drugs are approved by the FDA. A healthy balanced diet can provide all the vitamins and minerals needed.

Food and Metabolism

The amount of energy that is needed or ingested per day is measured in calories. A calorie is the amount of heat it takes to raise 1 g of water by 1 °C. On average, a person needs 1500 to 2000 calories per day to sustain (or carry out) daily activities. The total number of calories needed by one person is dependent on his/her body mass, age, height, gender, activity level, and the amount of exercise per day. If exercise is a regular part of one's day, more calories are required. As a rule, people underestimate the number of calories ingested and overestimate the amount they burn through exercise. This can lead to ingestion of too many calories per day. The accumulation of an extra 3500 calories adds one pound of weight. If an excess of 200 calories per day is ingested, one extra pound of body weight will be gained every 18 days. At that rate, an extra 20 pounds can be gained over the course of a year. Of course, this increase in calories could be offset by increased exercise. Running or jogging one mile burns almost 100 calories.

The type of food ingested also affects the body's metabolic rate. Processing of carbohydrates requires less energy than processing of proteins. In fact, the breakdown of carbohydrates requires the least amount of energy; whereas, the processing of proteins demands the most energy. In general, the amount of calories ingested and the amount of calories burned determines the overall weight. To lose weight, the number of calories burned per day must exceed the number ingested. Calories are in almost everything one ingests, so when considering calorie intake, beverages must also be considered. Metabolic

rates and calorie requirements will be discussed in further detail in the weight management chapter.

MyPlate

To help provide guidelines regarding the types and quantities of food that should be eaten every day, the U.S. Department of Agriculture (USDA) has updated its food guidelines from MyPyramid to MyPlate. It has put the recommended elements of a healthy meal into the context of a place setting of food. MyPlate categorizes food into the standard six food groups: fruits, vegetables, grains, protein foods, dairy, and oils. The accompanying website gives clear recommendations regarding quantity and type of each food that one should consume each day as well as identifying which foods belong in each category. The accompanying graphic gives a clear visual with general recommendations for a healthy and balanced meal. The guidelines recommend to “Make half your plate fruits and vegetables.” The other half is grains and protein with a slightly higher quantity of grains than protein. Dairy products are represented by a drink, but the quantity can be applied to other dairy products as well.

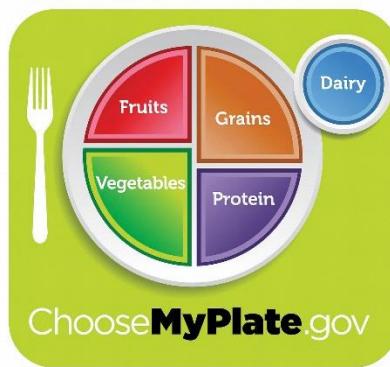


Figure 3. MyPlate

[**ChooseMyPlate.gov**](http://ChooseMyPlate.gov) provides extensive online resources for planning a healthy diet and lifestyle including offering weight management tips and recommendations for physical activity. It also includes the SuperTracker, a web-based application to help analyze one's diet and physical activity.

FYI: Obesity in the United States is an epidemic. IN 2010, the U.S. Centers for Disease Control and Prevention reported that nearly 36 percent of adults over 20 years old were obese and an additional 33 percent were overweight leaving only about 30 percent of the population at a healthy weight. Research has shown that losing weight can help reduce or reverse the complications associated with obesity. The data and health issues associated with being overweight and obese will be discussed further in the weight management chapter.

Section 9.2 Planning a Diet

The definition of diet is anything that is consumed by a particular person or people on a regular basis. That means if someone routinely drinks coffee in the morning, that is part of

his/her diet. If a person consistently eats a Big Mac from McDonald's, that is part of his/her diet.

However, it is clear that food choices influence short-term and long-term health. That is why it is so important to make wise choices in what one eats on a regular basis. If a person chooses to have a diet high in calories without balancing energy use, that person can expect to put on unhealthy weight. A diet that is high in fiber, with the appropriate amount of calories and proper amounts of the macronutrients, will contribute to a healthy body.

When people discuss "going on a diet," they are actually talking about changing their existing dietary habits in order to change their body shape. All people are "on a diet" because everyone eats! Many times, the term diet is thought of as a method to lose weight or to change body shape. However, it is important to focus on the nutritional concepts listed below, so long-term health can be achieved.

Decisions about nutrition can be difficult. Knowing and using scientific research can lead to better health. Over time public health organizations have developed tools based on nutritional science to help people design healthy diets. These tools should be used as guidelines for each individual with the awareness that everyone is different and therefore has different needs. Everyone, regardless of age, size, shape, physique, can benefit from learning and utilizing the following tools:

Acceptable Macronutrient Distribution Range (AMDR)

The AMDR describes the proportions of daily caloric intake that should be carbohydrates, lipids, and proteins. Basically the AMDR provides guidelines on how many macronutrient calories one should consume a day.

According to the AMDR, the range of caloric intake in a daily diet should be:

- Carbohydrates: 45-65%
- Lipids: 20-35%
- Proteins: 10-35%

Dietary Reference Intakes (DRI)

The DRI's are reference values of nutrient intake that help with nutrition planning and assessment of healthy individuals. There are four measures that together comprise the DRI:

- Recommended Dietary Allowance (RDA): the average daily dietary intake level that is sufficient to meet the nutrient requirement of nearly all (about 97%) healthy individuals in a group. This is the basic quantity of a nutrient recommended.
- Adequate Intake (AI): a value based on observed or experimentally determined approximations of nutrient intake by a group (or groups) of healthy people—used when an RDA cannot be determined. This is the minimum amount of a nutrient needed for maintaining health.

- Tolerable Upper Intake Level (UL): the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population. As intake increases above the UL, the risk of adverse effects increases. This is the maximum that would be consumed prior to developing negative effects of eating too much. This is not a level that is met, but rather one that is avoided to prevent a decrease in health.
- Estimated Average Requirement (EAR): a nutrient intake value that is estimated to meet the requirement of half the healthy individuals in a group. These nutrient values should be used as goals for dietary intake for health.

4 Key Concepts for Personalizing a Healthy Diet

Personalizing meal plans can be extremely beneficial psychologically as well as physically. Knowing that one is eating healthy reduces some of the subconscious doubts about doing what needs to be done to be well. However, as with every healthy practice, there can be pitfalls. To help avoid these, there are 4 approaches that can be taken:

- 10 Assessing and changing your diet
- 11 Staying committed to a healthy diet
- 12 Try additions and substitutions to bring your current diet closer to your goals
- 13 Plan ahead for challenging situations

Planning Healthy Meals

Individual requirements for nutrients vary considerably depending on factors such as age and gender. Other relevant factors are size, metabolic rate, and occupation. A farmer would have a different dietary need than someone in a sedentary occupation. The body also has stores of certain nutrients (fat-soluble vitamins, for example) so that variations in daily intake of such nutrients can be accommodated. Thus it could be misleading to recommend a particular daily intake level.

When considering dietary needs, various techniques have been established by health officials to assist people in choosing foods and food amounts wisely. [Choose My Plate](#) is a graphic representation of what a healthy plate of food might look like. Other tools, such as [meal planning guides](#) have also been established.

Nutrition Labels

Perhaps one of the most effective tools provided to consumers is the nutrition label that is by law on all food packaging. This information can be useful for evaluating the nutrient content of food and planning healthy meals.

[Understanding Food Labels](#)

In the United States, the Food and Drug Administration (FDA) requires packaged foods to have a label that helps consumers make educated decisions about the foods they purchase.

The label provides caloric, macronutrient, and some micronutrient content of the food. Labels also indicate ingredients and manufacturer information. Understanding the information on food labels can lead to healthy choices about food. This page will outline how to interpret food labels. FYI: Food labels do not provide all nutritional information; they just include the basics to help consumers make healthy food decisions.

Information On Food Labels

- **Name of product:** Sometimes the name of the product includes important information. For example some brands are vegetarian, kosher, gluten-free, etc. It is also important to compare/contrast ingredients in generic and brand name foods
- **Serving Size:** It's important to pay attention to how many servings a package contains. Many packages contain multiple servings.

The secret to serving size is in your hand.

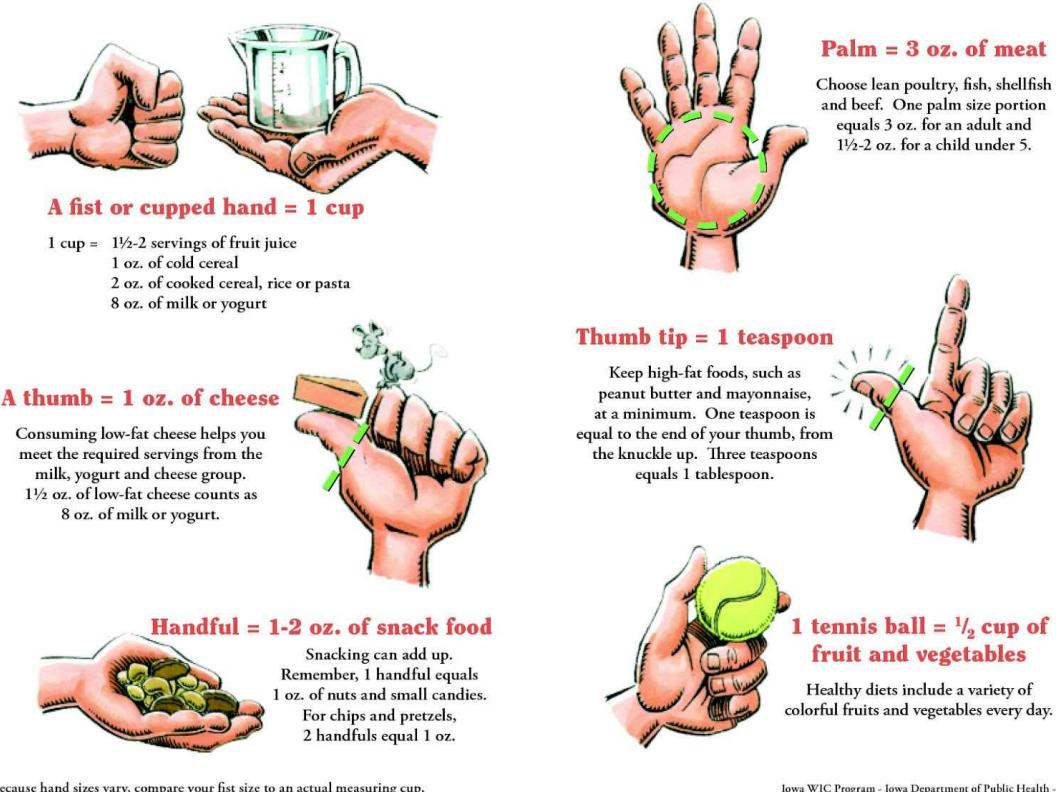


Figure 4. Using your hand to determine serving size

- **Calories:** Pay attention to whether the caloric content of the food is per serving or per package. Also, some food labels indicate calories before or after preparation.
- **Fats:** The food label includes all fats. Note that the label indicates different types of fats. A later chapter will address different fats and how they are important in human nutrition.
- **Cholesterol:** Dietary cholesterol is a major factor in cardiovascular health. Limiting the intake of cholesterol can prevent heart disease.

- **Sodium:** Another major factor in promoting good health is limiting the amount of sodium intake.
- **Carbohydrates:** The food label includes simple and complex carbohydrates. Note that the label indicates different types of carbohydrates; a later chapter will address these and how they are important in human nutrition.
- **Proteins:** Protein intake needs to be carefully monitored because over or under consumption of protein can cause severe issues.
- **Vitamins and Minerals:** There are four vitamins and minerals (Vitamin D, Calcium, Iron, and Potassium) that are required on food labels; however, the label might include more than these four.
- **Ingredients:** The ingredients are listed in order of their content per volume. If sugar is listed as the first ingredient, there is more sugar in the food than any other ingredient. The last ingredient has the least amount in the food.
- **Name of manufacturer:** In addition to the Nutrition Facts, the food label includes the name and contact information for the manufacturer as required by law.
- **Allergens:** Food manufacturers are required to draw specific attention to common allergens such as nuts, milk products, soy, etc. There is no specific location for allergen information, but it should be someplace on the packaging.

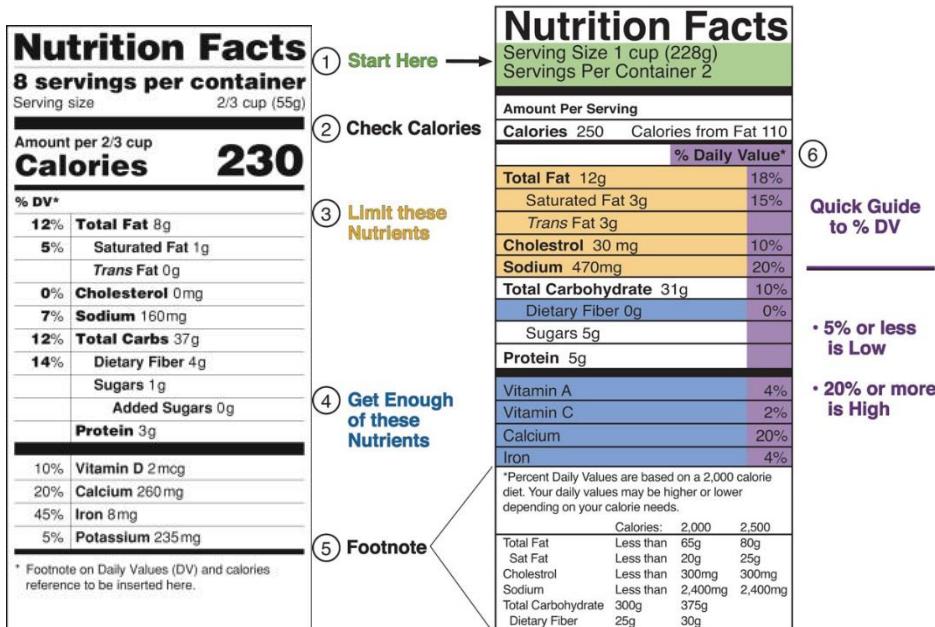


Figure 5. Nutrition Facts

To learn additional details about all of the information contained within the Nutrition Facts panel, see the following website:
<http://www.fda.gov/Food/ResourcesForYou/Consumers/NFLPM/ucm274593.htm>

Finding Quality Nutrition Research

"New study shows that margarine contributes to arterial plaque." "Asian study reveals that two cups of coffee per day can have detrimental effects on the nervous system." How do you react when you read news of this nature? Do you boycott margarine and coffee? When reading nutrition-related claims, articles, websites, or advertisements always remember that one study does not substantiate a fact. One study neither proves nor disproves anything. Readers who may be looking for complex answers to nutritional dilemmas can quickly misconstrue such statements and be led down a path of misinformation. Listed below are ways that you can develop discerning eyes when reading nutritional news.

- The scientific study under discussion should be published in a peer-reviewed journal, such as the *Journal of the International Society of Sports Nutrition*. Question studies that come from less trustworthy sources (such as non peer-reviewed journals or websites) or that are not published.
- The report should disclose the methods used by the researcher(s). Did the study last for three or thirty weeks? Were there ten or one hundred participants? What did the participants actually do? Did the researcher(s) observe the results themselves or did they rely on self-reports from program participants?
- Who were the subjects of this study? Humans or animals? If human, are any traits/characteristics noted? You may realize you have more in common with certain program participants and can use that as a basis to gauge if the study applies to you.
- Credible reports often disseminate new findings in the context of previous research. A single study on its own gives you very limited information, but if a body of literature supports a finding, it gives you more confidence in it.
- Peer-reviewed articles deliver a broad perspective and are inclusive of findings of many studies on the exact same subject.
- When reading such news, ask yourself, "Is this making sense?" Even if coffee does adversely affect the nervous system, do you drink enough of it to see any negative effects? Remember, if a headline professes a new remedy for a nutrition-related topic, it may well be a research-supported piece of news, but more often than not it is a sensational story designed to catch the attention of an unsuspecting consumer. Track down the original journal article to see if it really supports the conclusions being drawn in the news report.

When reading information on websites, remember the following criteria for discerning if the site is valid:

- Who sponsors the website?
- Are names and credentials disclosed?
- Is an editorial board identified?

- Does the site contain links to other credible informational websites? Even better, does it reference peer-reviewed journal articles? If so, do those journal articles actually back up the claims being made on the website?
- How often is the website updated?
- Are you being sold something at this website?
- Does the website charge a fee?

Trustworthy Sources

Now let's consider some reputable organizations and websites from which you can obtain valid nutrition information.

Organizations Active in Nutrition Policy and Research

- 1. US Department of Agriculture Food and Nutrition Information Center.** The USDA site <http://fnic.nal.usda.gov> has more than twenty-five hundred links to dietary, nutrition, diet and disease, weight and obesity, food-safety and food-labeling, packaging, dietary supplement and consumer questions sites. Using this interactive site, you can find tips and resources on how to eat a healthy diet, my Foodapedia, and a food planner, among other sections.
- 2. The Academy of Nutrition and Dietetics (AND).** The AND promotes scientific evidenced-based, research-supported food and nutrition related information on its website, <http://www.eatright.org>. It is focused on informing the public about recent scientific discoveries and studies, weight-loss concerns, food safety topics, nutrition issues, and disease prevention.
- 3. Department of Health and Human Services.** The HHS website, HealthFinder.gov, provides credible information about healthful lifestyles and the latest in health news. A variety of online tools are available to assist with food-planning, weight maintenance, physical activity, and dietary goals. You can also find healthful tips for all age groups, tips for preventing disease, and on daily health issues in general.
- 4. Centers for Disease Control and Prevention.** The Centers for Disease Control and Prevention (<http://www.cdc.gov>) distributes an online newsletter called *CDC Vital Signs*. This newsletter is a valid and credible source for up-to-date public health information and data regarding food, nutrition, cholesterol, high blood pressure, obesity, teenage drinking, and tobacco usage.
- 5. Dietitians of Canada.** Dietitians of Canada, <http://www.dietitians.ca/>, is the national professional association for dietitians. It provides trusted nutrition information to Canadians and health professionals.

Genetically Modified Foods

Genetically modified foods (also known as GM or GMO foods), are plants or animals that have undergone some form of genetic engineering. In the United States, much of the soybean, corn, and canola crop is genetically modified. The process involves the alteration of an organism's DNA, which allows farmers to cultivate plants with desirable characteristics.

For example, scientists could extract a gene that produces a chemical with antifreeze properties from a fish that lives in an arctic region (such as a flounder). They could then splice that gene into a completely different species, such as a tomato, to make it resistant to frost, which would enable farms to grow that crop year-round.

Certain modifications can be beneficial in resisting pests or pesticides, improving the ripening process, increasing the nutritional content of food, or providing resistance to common viruses. Although genetic engineering has improved productivity for farmers, it has also stirred up debate about consumer safety and environmental protection. Possible side effects related to the consumption of GM foods include an increase in allergenicity, or tendencies to provoke allergic reactions. There is also some concern related to the possible transfer of the genes used to create genetically engineered foods from plants to people. This could influence human health if antibiotic-resistant genes are transferred to the consumer. Therefore, the World Health Organization (WHO) and other groups have encouraged the use of genetic engineering without antibiotic-resistance genes. Genetically modified plants may adversely affect the environment as well and could lead to the contamination of non-genetically engineered organisms.

Genetically modified foods fall under the purview of the EPA, the USDA, and the FDA. Each agency has different responsibilities and concerns in the regulation of GM crops. The EPA ensures that pesticides used for GM plants are safe for the environment. The USDA makes sure genetically engineered seeds are safe for cultivation prior to planting. The FDA determines if foods made from GM plants are safe to eat. Although these agencies act independently, they work closely together and many products are reviewed by all three.

Organic food products

Organically produced foods have been cultivated or raised without synthetic pesticides, antibiotics, or genetic engineering. Certified organic foods can be identified by the USDA's stamp and is usually more expensive than conventionally produced foods. There have been a lot of questions about the nutritional superiority of organic foods over those traditionally produced. These questions do not have simple answers. Most studies differ substantially in their methodology and involve many different aspects of the food being studied. The USDA makes no claims that organic food is safer or more nutritious than conventionally produced food, and indeed many organic foods - e.g., milk, butter, ice cream, meat - are likely to match their conventional counterparts for fat and calories.

There are, however, specific health reasons that motivate shoppers to buy natural or organic, foods. For instance, people with food allergies, chemical allergies or intolerance to preservatives can substitute organic foods, personal care products and clothing. To reduce fat and cholesterol in their diets, consumers can replace meat with products made from organic soy, wheat or vegetables.

Some organic foods also have significantly higher levels of cancer-fighting antioxidants, according to a study of corn, strawberries and marionberries, which was published in Feb. 26, 2003, in the Journal of Agriculture and Food Chemistry, a peer-reviewed publication of the American Chemical Society ("Bitter or Harsh Phenolics Guard the Plant Against These Pests").

Some officials say, however, that organic foods may at times 'be less safe than conventional foods. In October 2002, USDA's undersecretary for food safety warned that organic foods' lack of preservatives makes them vulnerable to bacteria and parasites. The following month, the Institute of Food Technologies issued a release stating that organics "have the potential for greater pathogen contamination." Also in 2002, records from the U.S. Food and Drug Administration and Health Canada revealed that organic and all-natural products are eight times more likely to be recalled for safety problems, including bacterial contamination. Organic products are as safe as conventional ones, according to the Organic Trade Association. "Certified organic growers follow strict guidelines for safe and hygienic food production. As with all food producers, they must comply with local, state and federal health standards.

Dietary Food Trends

Hundreds of years ago, when food was less accessible and daily life required much more physical activity, people worried less about obesity and more about simply getting enough to eat. In today's industrialized nations, conveniences have solved some problems and introduced new ones, including the hand-in-hand obesity and diabetes epidemics. Fad diets gained popularity as more North Americans struggled with excess pounds. However, new evidence-based approaches that emphasize more holistic measures are on the rise. These new dietary trends encourage those seeking to lose weight to eat healthy, whole foods first, while adopting a more active lifestyle. These sound practices put dietary choices in the context of wellness and a healthier approach to life.

Functional Foods

Many people seek out foods that provide the greatest health benefits. This trend is giving rise to the idea of **functional foods**, which not only help meet basic nutritional needs but also are reported to fight illness and aging. According to the Academy of Nutrition and Dietetics (AND), formerly known as the The Academy of Nutrition and Dietetics, functional foods may reduce the risk of disease or promote optimal health. The AND recognizes four types of functional foods. They are: conventional foods, modified foods, medical foods, and special dietary use foods.

The first group, **conventional foods**, represents the simplest form of functional foods. They are whole foods that have not been modified. Examples include whole fruits and vegetables (which are abundant in phytochemicals and antioxidants), yogurt and kefir (which contain natural probiotic bacteria that can help maintain digestive system health), and dark chocolate (which contains antioxidants).

- **Modified foods** have been fortified, enriched, or enhanced with additional nutrients or bioactive compounds. Foods are modified using biotechnology to improve their nutritional value and health attributes. Examples of modified foods include calcium-fortified orange juice, breads enriched with B vitamins, iodized salt, cereals fortified

with vitamins and minerals, margarine enhanced with plant sterols, and energy drinks that have been enriched with herbs (ginseng or guarana) or amino acids (taurine). It is important to consider that the health claims of some modified foods may be debatable, or entirely fraudulent. Check with a health professional regarding the effects of modified foods on your health.

- **Medical foods** are designed for enteric administration under the guidance of a medical professional. (During enteric administration, food is treated so that it goes through the stomach undigested. Instead, the food is broken down in the intestines only.) Medical foods are created to meet very specific nutritional requirements. Examples of medical foods include liquid formulas for people with kidney disease, liver disease, diabetes, or other health issues. Medical food is also given to comatose patients through a gastronomy tube because they cannot eat by mouth.
- **Special dietary use foods** do not have to be administered under a doctor's care and can be found in a variety of stores. Similar to medical foods, they address special dietary needs and meet the nutritional requirements of certain health conditions. For example, a bottled oral supplement administered under medical supervision is a medical food, but it becomes a special dietary use food when it is sold to retail customers. Examples of special dietary use foods include gluten-free foods, lactose-free dairy products, and formulas and shakes that promote weight loss.

Section 9.3 Popular Diets

The concept of functional foods represents initiatives aimed at addressing health problems. Certain diet plans take this concept one step further, by striving to prevent or treat specific conditions. For example, it is widely understood that people with diabetes need to follow a particular diet. Although some of these diet plans may be nutritionally sound, use caution because some diets may be fads or be so extreme that they actually *cause* health problems. Before experimenting with a diet, discuss your plans with your doctor or a registered dietitian. Throughout this section, we will discuss some of the more popular diets. Some fall under the category of fad diets, while others are backed by scientific evidence. Those that fall into the latter category provide a good foundation to build a solid regimen for optimal health.

The DASH Diet

The Dietary Approaches to Stop Hypertension, or DASH diet, focuses on reducing sodium intake to either 2,300 milligrams per day (as recommended by the *Dietary Guidelines for Americans*) or 1,500 milligrams per day. The DASH diet is an evidence-based eating plan that can help reduce high blood pressure. This plan may also decrease the risk of heart attack, stroke, diabetes, osteoporosis, and certain cancers. DASH tips to lower sodium include:

- Using spices instead of salt to add flavor

- Reading sodium content on processed or canned food labels, and choosing low-sodium options
- Removing some sodium from canned foods (such as beans) by rinsing the product before consumption
- Avoiding salt when cooking

DASH dieters eat lots of whole grains and high-fiber fruits and vegetables, and moderate amounts of low-fat dairy products, lean meats, and heart-healthy fish. In addition, DASH limits the use of saturated fats to less than 7 percent of total calories, and restricts the consumption of sweets and alcohol. The DASH diet also calls for consuming less added sugar and drinking fewer sugar-sweetened drinks. It replaces red meat with fish and legumes and calls for increased calcium, magnesium, potassium, and fiber. Also, even though some people on the DASH diet may find it lowers their HDL (good) cholesterol along with their LDL (bad) cholesterol, it still has a positive cumulative effect on heart health.

The Gluten-Free Diet

The gluten-free diet helps people whose bodies cannot tolerate **gluten**, a protein found in wheat, barley, and rye. One of the most important ways to treat this condition is to avoid the problematic foods, which is not easy. Although following a gluten-free diet is challenging, it is prescribed for patients with gluten intolerance and celiac disease, an autoimmune disorder with a genetic link. People who have celiac disease cannot consume gluten products without damaging their intestinal lining. Eating a gluten-free diet means finding replacements for bread, cereal, pasta, and more. It also means emphasizing fresh fruits, vegetables, and other foods without gluten. However, it is important to note that the gluten-free trend has become something of a fad even for those without a gluten intolerance. Celiac disease is a relatively rare condition found in only 1 percent of the population. Therefore, a gluten-free diet should be followed only with a physician's recommendation.

Low-Carb Diets

Low-carb diets, which include the Atkins Diet and the South Beach Diet, focus on limiting carbohydrates—such as grains, fruit, and starchy vegetables—to promote weight loss. The theory behind the low-carb diet is that insulin prevents the breakdown of fat by allowing sugar in the form of blood glucose to be used for energy. Proponents of this approach believe that because limiting carbs generally lowers insulin levels, it would then cause the body to burn stored fat instead. They believe this method not only brings about weight loss, but also reduces the risk factors for a number of conditions. However, some studies have shown that people who followed certain low-carb diet plans for two years lost an average of nearly 9 pounds, which is similar to the amount of weight lost on higher carbohydrate diets.

The benefits of this kind of diet include an emphasis on whole, unprocessed foods and a de-emphasis of refined carbohydrates, such as white flour, white bread, and white sugar. However, there are a number of downsides. Typically, the first two weeks allow for only 20 grams of carbs per day, which can be dangerously low. In addition, dieters using the low-carb approach tend to consume twice as many saturated fats as people on a diet high in healthy carbohydrates. Low-carb diets are also associated with a higher energy intake, and the notion that “calories don’t count,” which is prevalent in this kind of diet, is not supported by scientific evidence.

The Mediterranean Diet

The traditional Mediterranean diet incorporates many elements of the dietary choices of people living in Greece and southern Italy. The Mediterranean diet focuses on small portions of nutritionally-sound food. This diet features food from plant sources, including vegetables, fruits, whole grains, beans, nuts, seeds, breads and potatoes, and olive oil. It also restricts the consumption of processed foods and recommends eating locally grown foods rich in micronutrients and antioxidants. Other aspects of this eating plan include consuming fish and poultry at least twice per week, eating red meat only a few times per month, having up to seven eggs per week, and drinking red wine in moderation and with meals. Unlike most diets, the Mediterranean diet does not cut fat consumption across the board. Instead, it incorporates low-fat cheese and dairy products, and it substitutes olive oil, canola oil, and other healthy oils for butter and margarine.

More than fifty years of nutritional and epidemiological research has shown that people who follow the Mediterranean diet have some of the lowest rates of chronic disease and the highest rates of longevity among the populations of the world. Studies have shown that the Mediterranean diet also helps to decrease excess body weight, blood pressure, blood fats, and blood sugar and insulin levels significantly.

The Raw Food Diet

The raw food diet is followed by those who avoid cooking as much as possible in order to take advantage of the full nutrient content of foods. The principle behind **raw foodism** is that plant foods in their natural state are the most wholesome for the body. The raw food diet is not a weight-loss plan, it is a lifestyle choice. People who practice raw foodism eat only uncooked and non-processed foods, emphasizing whole fruits and vegetables. Staples of the raw food diet include whole grains, beans, dried fruits, seeds and nuts, seaweed, sprouts, and unprocessed produce. As a result, food preparation mostly involves peeling, chopping, blending, straining, and dehydrating fruits and vegetables.

The positive aspects of this eating method include consuming foods that are high in fiber and nutrients, and low in calories and saturated fat. However, the raw food diet offers little in the way of protein, dairy, or fats, which can cause deficiencies of the vitamins A, D, E, and K. In addition, not all foods are healthier uncooked, such as spinach and tomatoes. Also, cooking eliminates potentially harmful microorganisms that can cause foodborne illnesses. Therefore, people who primarily eat raw foods should thoroughly clean all fruit and vegetables before eating them. Poultry and other meats should *always* be cooked before eating.

Vegetarian and Vegan Diets

Vegetarian and vegan diets have been followed for thousands of years for different reasons, including as part of a spiritual practice, to show respect for living things, for health reasons, or because of environmental concerns. For many people, being a vegetarian is a logical outgrowth of “thinking green.” When a food system is heavily focused on meat production there are deforestation issues, overgrazing of land and pasturage, and animal abuses. By avoiding animal flesh, vegetarians hope to look after their own health and that of the planet at the same time. Broadly speaking, vegetarians eat beans, grains, and fruits and vegetables, and do not eat red meat, poultry, seafood, or any other animal flesh. Some vegetarians, known as lactovegetarians, will eat dairy products. Others, known as lacto-ovo vegetarians, will eat dairy products and eggs. A vegan diet is the most restrictive vegetarian diet—vegans do not eat dairy, eggs, or other animal products, and some do not eat honey. Vegetarian diets have a number of benefits. Well-balanced eating plans can lower the risk of a number of chronic conditions, including heart disease, diabetes, and obesity. They also help to promote sustainable agriculture. However, if a vegetarian does not vary his or her food choices, the diet may be insufficient in calcium, iron, omega-3 fatty acids, zinc, and vitamin B₁₂. Also, if people who follow these diets do not plan out their meals, they may gravitate toward foods high in fats.

Table 2: The Pros and Cons of Seven Popular Diets

Diet	Pros	Cons
DASH Diet	<ul style="list-style-type: none"> Recommended by the National Heart, Lung, and Blood Institute, the American Heart Association, and many physicians Helps to lower blood pressure and cholesterol Reduces risk of heart disease and stroke Reduces risk of certain cancers Reduces diabetes risk 	<ul style="list-style-type: none"> There are very few negative factors associated with the DASH diet
Gluten-Free Diet	<ul style="list-style-type: none"> Reduces the symptoms of gluten intolerance, such as chronic diarrhea, cramping, constipation, and bloating 	<ul style="list-style-type: none"> Risk of folate and iron deficiencies Special gluten-free products can be hard to find and expensive

	<ul style="list-style-type: none"> Promotes healing of the small intestines for people with celiac disease, preventing malnutrition May support weight loss May be beneficial for other autoimmune diseases, such as Parkinson's disease, rheumatoid arthritis, and multiple sclerosis May be helpful for Types 1 and 2 diabetes and anemia 	<ul style="list-style-type: none"> Requires constant vigilance and careful food label reading, since gluten is found in many products
Low-Carb Diet	<ul style="list-style-type: none"> Restricts refined carbohydrates, such as white flour and white sugar May temporarily improve blood sugar or blood cholesterol levels 	<ul style="list-style-type: none"> Not entirely evidence-based Results in higher fat and protein consumption
Mediterranean Diet	<ul style="list-style-type: none"> A reduced risk of cardiovascular disease and mortality A lower risk of cancer De-emphasizes processed foods and emphasizes whole foods and healthy fats Lower sodium intake, due to fewer processed foods Emphasis on monosaturated fats leads to lower cholesterol Highlighting fruits and vegetables raises consumption of antioxidants 	<ul style="list-style-type: none"> Does not specify daily serving amounts Potential for high fat and high calorie intake as nuts and oils are calorie-dense foods Drinking one to two glasses of wine per day may not be healthy for those with certain conditions

Raw Food Diet	<ul style="list-style-type: none"> • Emphasizes whole foods • Focuses on nutritionally-rich foods • High in fiber 	<ul style="list-style-type: none"> • Not entirely evidence-based • Very restrictive and limits protein and healthy fat intake • Could encourage the development of foodborne illness • Extremely difficult to follow • Can cause deficiencies in essential vitamins
Vegetarianism and Veganism	<ul style="list-style-type: none"> • May reduce cancer risk • May reduce heart disease risk • May reduce obesity risk • May help prevent Type 2 diabetes • Helps with weight reduction and weight maintenance 	<ul style="list-style-type: none"> • Guidelines regarding fat and nutrient consumption must be followed • Requires vigilance to watch out for hidden animal products • Requires negotiating meals and holidays with meat-eating friends and family

Section 9.4 Food Supplements and Food Replacements

Current trends also include the use of supplementation to promote health and wellness. Vitamins, minerals, herbal remedies, and **supplements** of all kinds constitute big business and many of their advertising claims suggest that optimal health and eternal youth are just a pill away. The main types of dietary supplements are macronutrients (amino acids, proteins, essential fatty acids), micronutrients (vitamins and minerals that promote healthy body functions), probiotics (beneficial bacteria such as the kind found in the intestines), and herbal supplements, which often target a specific body part, such as bones. Some public health officials recommend a daily multivitamin due to the poor diet of most North Americans. The US Preventive Task Force also recommends a level of folate intake which can be easier to achieve with a supplement. In addition, the following people may benefit from taking daily vitamin and mineral supplements:

- women who are pregnant or breast-feeding
- premenopausal women who may need extra calcium and iron
- older adults
- people with health issues that affect their ability to eat
- vegetarians, vegans, and others avoiding certain food groups

However, before you begin using dietary supplementation, consider that the word *supplement* denotes something added. Vitamins, minerals, and other assorted remedies should be considered as extras. They are add-ons—not replacements—for a healthy diet. As food naturally contains nutrients in its proper package, remember that food should always be your primary source of nutrients. When considering taking supplements, it is important to recognize possible drawbacks that are specific to each kind:

Micronutrient Supplements.

Some vitamins and minerals are toxic at high doses. Therefore, it is vital to adhere to the Tolerable Upper Intake Levels (UL) so as not to consume too much of any vitamin. For example, too much vitamin A is toxic to the liver. Symptoms of vitamin A toxicity can include tinnitus (ringing in the ears), blurred vision, hair loss, and skin rash. Too much niacin can cause a peptic ulcer, hyperglycemia, dizziness, and gout.

Herbal Supplements

Some herbs cause side effects, such as heart palpitations and high blood pressure, and must be taken very carefully. Also, some herbs have contraindications with certain medicines. For example, Valerian and St. John's Wort negatively interact with certain prescription medications, most notably antidepressants. Additionally, there is a real risk of overdosing on herbs because they do not come with warning labels or package inserts.

Amino Acid Supplements

Certain amino acid supplements, which are taken by bodybuilders among others, can increase the risk of consuming too much protein. An occasional amino acid drink in the place of a meal is not a problem. However, problems may arise if you add the supplement to your existing diet. Most Americans receive two to three times the amount of protein required on a daily basis from their existing diets—taking amino acid supplements just adds to the excess.

Supplement Claims and Restrictions

The Food and Drug Administration (FDA) regulates supplements, but it treats them like food rather than pharmaceuticals. Dietary supplements must meet the FDA's Good Manufacturing Standards, but are not required to meet the standards for drugs, although

some companies do so voluntarily. Also, although supplement manufacturers are allowed to say a particular ingredient may reduce the risk of a disease or disorder, or that it might specifically target certain body systems, these claims are not approved by the FDA. This is why labels that make structural and functional claims are required to carry a disclaimer saying the product is not intended “to diagnose, treat, cure, or prevent any disease.” In addition, in the United States, supplements are taken off the market only after the FDA has proven that they are hazardous.

Before Taking Supplements

The phrase *caveat emptor* means “buyer beware,” and it is important to keep the term in mind when considering supplementation. Just because a product is “natural” that does not mean it can’t be harmful or dangerous, particularly if used inappropriately. The following are helpful questions to explore before deciding to take a supplement:

- Does the scientific community understand how this supplement works and are all its effects well known?
- Is there proof that the supplement actually performs in the manner that it claims?
- Does this supplement interact with food or medication?
- Is taking this supplement necessary for my health?
- Is the supplement affordable?
- Is the supplement safe and free from contaminants?

Lastly, please remember that a supplement is only as good as the diet that accompanies it. We cannot overstate the importance of eating a healthy, well-balanced diet designed to provide all of the necessary nutrients. Food contains many more beneficial substances, such as phytochemicals and fiber, that promote good health and cannot be duplicated with a pill or a regimen of supplements. Therefore, vitamins and other dietary supplements should never be a substitute for food. Nutrients should always be derived from food first.

Section 9.4 Food Safety

To minimize the risk of serious adverse health consequences or death from consumption of contaminated produce, the Food and Drug Administration (FDA) is establishing science-based minimum standards for the safe growing, harvesting, packing, and holding of produce, meaning fruits and vegetables grown for human consumption.

FDA is establishing these standards as part of implementation of the FDA Food Safety and Modernization Act. These standards do not apply to produce that is rarely consumed raw, produce for personal or on-farm consumption, or produce that is not a raw agricultural commodity. In addition, produce that receives commercial processing that adequately reduces the presence of microorganisms of public health significance is eligible for exemption from the requirements of this rule. The rule sets forth procedures, processes, and practices that minimize the risk of serious adverse health consequences or death,

including those reasonably necessary to prevent the introduction of known or reasonably foreseeable biological hazards into or onto produce and to provide reasonable assurances that the produce is not adulterated on account of such hazards. The FDA expects the rule to reduce foodborne illness associated with the consumption of contaminated produce.

Foodborne Illnesses

While the American food supply is among the safest in the world, the Federal government estimates that there are about **48 million cases of foodborne illness annually**—the equivalent of sickening 1 in 6 Americans each year. Each year these illnesses result in an estimated 128,000 hospitalizations and 3,000 deaths. These cases have driven authorities to seriously consider methods and regulations that help prevent the spread of foodborne illness.

Food Handling

Most foodborne illnesses can be avoided if you take the following precautionary steps:

CLEAN: Always wash your food, hands, counters, and cooking tools.

- Wash hands in warm soapy water for **at least** 20 seconds (sing *Happy Birthday* while washing and the 20 seconds will be over). Do this before and after touching food.
- Wash cutting boards, dishes, forks, spoons, knives and counter tops with hot soapy water. Do this after working with each food item.
- Rinse fruits and veggies well
- Clean the lids on canned goods before opening.

SEPARATE (Keep Apart): Keep raw foods apart from other raw foods. Germs can spread from one food to another.

- Keep raw meat, poultry, seafood, and eggs away from other foods in the shopping cart, bags, and the refrigerator.
- Do not reuse marinades used on raw foods unless first brought to a boil first.
- Use a separate cutting board and utensils for raw meats, and a designated plate and clean utensils for raw foods. This prevents cross-contamination.

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CHAPTER 10: Weight Management

Achieving and sustaining appropriate body weight across the lifespan is vital to maintaining good health and quality of life. Many behavioral, environmental, and genetic factors have been shown to affect a person's body weight. Calorie balance over time is the key to weight management. Calorie balance refers to the relationship between calories consumed from foods and beverages and calories expended in normal body functions (i.e., metabolic processes) and through physical activity. People cannot control the calories expended in metabolic processes, but they can control what they eat and drink, as well as how many calories they use in physical activity.

Calories consumed must equal calories expended for a person to maintain the same body weight. Consuming more calories than expended will result in weight gain. Conversely, consuming fewer calories than expended will result in weight loss. This can be achieved over time by eating fewer calories, being more physically active, or, best of all, a combination of the two.

Maintaining a healthy body weight and preventing excess weight gain throughout the lifespan are highly preferable to losing weight after weight gain. Once a person becomes obese, reducing body weight back to a healthy range requires significant effort over a span of time, even years. People who are most successful at losing weight and keeping it off do so through continued attention to calorie balance.

The current high rates of overweight and obesity among virtually all subgroups of the population in the United States demonstrate that many Americans are in calorie imbalance—that is, they consume more calories than they expend. To curb the obesity epidemic and improve their health, Americans need to make significant efforts to decrease the total number of calories they consume from foods and beverages and increase calorie expenditure through physical activity. Achieving these goals will require Americans to select a healthy eating pattern that includes nutrient-dense foods and beverages they enjoy, meets nutrient requirements, and stays within calorie needs. In addition, Americans can choose from a variety of strategies to increase physical activity.

Key Recommendations

- Prevent and/or reduce overweight and obesity through improved eating and physical activity behaviors.
- Control total calorie intake to manage body weight. For people who are overweight or obese, this will mean consuming fewer calories from foods and beverages.
- Increase physical activity and reduce time spent in sedentary behaviors.
- Maintain appropriate calorie balance during each stage of life—childhood, adolescence, adulthood, pregnancy and breastfeeding, and older age.

An Epidemic of Overweight and Obesity

The prevalence of overweight and obesity in the United States is dramatically higher now than it was a few decades ago. This is true for all age groups, including children, adolescents, and adults. One of the largest changes has been an increase in the number of Americans in the obese category. As shown in the maps below, the prevalence of obesity has doubled and in some cases tripled between the 1990s and 2011.

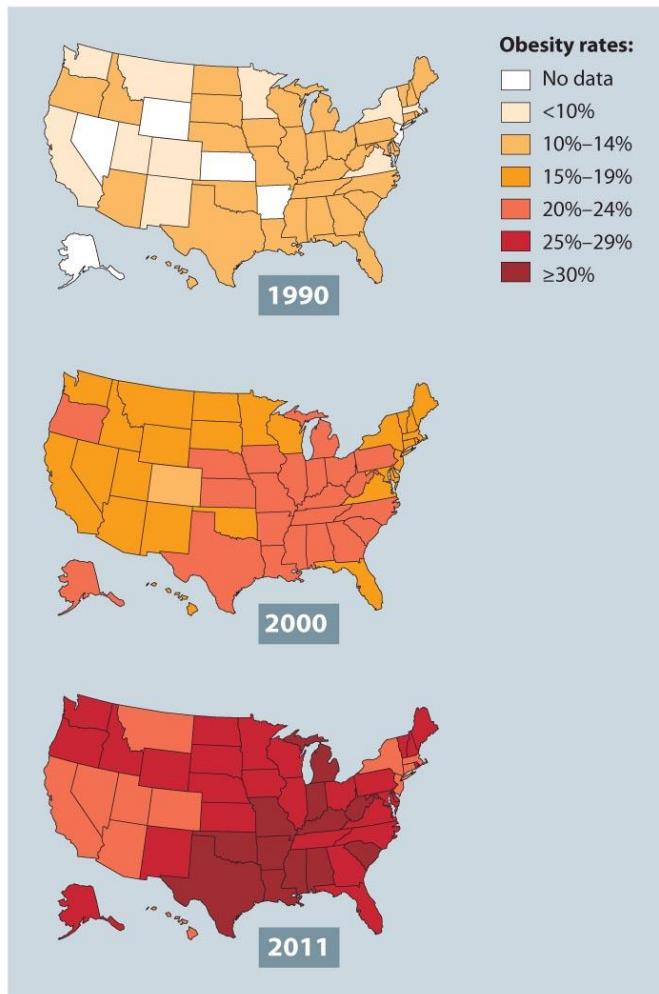


Figure 1. Obesity Rates

The high prevalence of overweight and obesity across the population is of concern because individuals who are overweight obese, compared to those with a normal or healthy weight, are at increased risk for many serious diseases and health conditions, including the following:

- All-causes of death (mortality)
- High blood pressure (Hypertension)
- High LDL cholesterol, low HDL cholesterol, or high levels of triglycerides (Dyslipidemia)

- Type 2 diabetes
- Coronary heart disease
- Stroke
- Gallbladder disease
- Osteoarthritis (a breakdown of cartilage and bone within a joint)
- Sleep apnea and breathing problems
- Some cancers (endometrial, breast, colon, kidney, gallbladder, and liver)
- Low quality of life
- Mental illness such as clinical depression, anxiety, and other mental disorders
- Body pain and difficulty with physical functioning

Ultimately, obesity can increase the risk of premature death. These increased health risks are not limited to adults. Weight-associated diseases and conditions that were once diagnosed primarily in adults are now observed in children and adolescents with excess body fat. For example, cardiovascular disease risk factors, such as high blood cholesterol and hypertension, and type 2 diabetes are now increasing in children and adolescents. The adverse effects also tend to persist through the lifespan, as children and adolescents who are overweight and obese are at substantially increased risk of being overweight and obese as adults and developing weight-related chronic diseases later in life. Primary prevention of obesity, especially in childhood, is an important strategy for combating and reversing the obesity epidemic.

All Americans—children, adolescents, adults, and older adults—are encouraged to strive to achieve and maintain a healthy body weight. Adults who are obese should make changes in their eating and physical activity behaviors to prevent additional weight gain and promote weight loss. Adults who are overweight should not gain additional weight, and most, particularly those with cardiovascular disease risk factors, should make changes to their eating and physical activity behaviors to lose weight. Children and adolescents are encouraged to maintain calorie balance to support normal growth and development without promoting excess weight gain. Children and adolescents who are overweight or obese should change their eating and physical activity behaviors so that their BMI-for-age percentile does not increase over time. Further, a health care provider should be consulted to determine appropriate weight management for the child or adolescent. Families, schools, and communities play important roles in supporting changes in eating and physical activity behaviors for children and adolescents.

Maintaining a healthy weight also is important for certain subgroups of the population, including women who are capable of becoming pregnant, pregnant women, and older adults.

- Women are encouraged to achieve and maintain a healthy weight before becoming pregnant. This may reduce a woman's risk of complications during pregnancy, increase the chances of a healthy infant birth weight, and improve the long-term health of both mother and infant.
- Pregnant women are encouraged to gain weight within the 2009 Institute of Medicine (IOM) gestational weight gain guidelines. Maternal weight gain during pregnancy outside the recommended range is associated with increased risks for maternal and child health.

- Adults ages 65 years and older who are overweight are encouraged to not gain additional weight. Among older adults who are obese, particularly those with cardiovascular disease risk factors, intentional weight loss can be beneficial and result in improved quality of life and reduced risk of chronic diseases and associated disabilities.

Section 10.1 Assessing Body Weight and Body Composition

Body Mass Index (BMI) is a number calculated from a person's weight and height. BMI is a fairly reliable indicator of body fatness for most people. BMI does not measure body fat directly, but research has shown that BMI correlates to direct measures of body fat, such as underwater weighing and dual energy x-ray absorptiometry (DXA). BMI can be considered an alternative for direct measures of body fat. Additionally, BMI is an inexpensive and easy-to-perform method of screening for weight categories that may lead to health problems.

How is BMI used?

BMI is used as a screening tool to identify possible weight problems for adults. However, BMI is not a diagnostic tool. For example, a person may have a high BMI. However, to determine if excess weight is a health risk, a healthcare provider would need to perform further assessments. These assessments might include skinfold thickness measurements, evaluations of diet, physical activity, family history, and other appropriate health screenings.

Calculating BMI is one of the best methods for population assessment of overweight and obesity. Because calculation requires only height and weight, it is inexpensive and easy to use for clinicians and for the general public. The use of BMI allows people to compare their own weight status to that of the general population.

Other methods for Assessing Body Composition

Other methods to measure body fatness include skinfold thickness measurements (with calipers), underwater weighing, bioelectrical impedance, and dual-energy x-ray absorptiometry (DEXA). However, these methods are not always readily available, and they are either expensive or need highly trained personnel. Furthermore, many of these methods can be difficult to standardize across observers or machines, complicating comparisons across studies and time periods.

Underwater (hydrostatic) weighing:

Measures the amount of water a person displaces when completely submerged. Fat tissue is less dense than muscle or bone, so body fat can be computed within a 2%–3% margin of error by comparing weight underwater and out of water.



Skinfolds:

Involves “pinching” a person’s fold of skin (with its underlying layer of fat) at various locations of the body. The fold is measured using a specially designed caliper. When performed by a skilled technician, it can estimate body fat with an error of 3%–4%.



Bioelectrical impedance analysis (BIA):

Involves sending a very low level of electrical current through a person’s body. As lean body mass is made up of mostly water, the rate at which the electricity is conducted gives an indication of a person’s lean body mass and body fat. Under the best circumstances, BIA can estimate body fat with an error of 3%–4%.



Dual-energy X-ray absorptiometry (DXA):

The technology is based on using very-low-level X ray to differentiate between bone tissue, soft (or lean) tissue, and fat (or adipose) tissue. The margin of error for predicting body fat is 2%–4%.



Bod Pod:

Uses air displacement to measure body composition. This machine is a large, egg-shaped chamber made from fiberglass. The person being measured sits in the machine wearing a swimsuit. The door is closed and the machine measures how much air is displaced. That value is used to calculate body fat, with a 2%–3% margin of error.



Figure 2. Other methods for Assessing Body Composition

Calculating BMI

BMI is calculated the same way for both adults and children. The calculation is based on the following formulas:

Measurement Units

Kilograms and meters

Formula and Calculation

Formula: weight (kg) / [height (m)]²

(or centimeters)	With the metric system, the formula for BMI is weight in kilograms divided by height in meters squared. Since height is commonly measured in centimeters, divide height in centimeters by 100 to obtain height in meters. Example: Weight = 68 kg, Height = 165 cm (1.65 m) Calculation: $68 \div (1.65)^2 = 24.98$ Formula: weight (lb) / [height (in)] ² x 703
Pounds and inches	Calculate BMI by dividing weight in pounds (lbs) by height in inches (in) squared and multiplying by a conversion factor of 703. Example: Weight = 150 lbs, Height = 5'5" (65") Calculation: $[150 \div (65)^2] \times 703 = 24.96$

Interpreting BMI for adults

For adults 20 years old and older, BMI is interpreted using standard weight status categories that are the same for all ages and for both men and women. For children and teens, on the other hand, the interpretation of BMI is both age- and sex-specific. The standard weight status categories associated with BMI ranges for adults are shown in the following table.

BMI	Weight Status
Below 18.5	Underweight
18.5 – 24.9	Normal
25.0 – 29.9	Overweight
30.0 and Above	Obese

The following link can be used as a quick reference guide to determine BMI:
https://www.nhlbi.nih.gov/health/educational/lose_wt/BMI/bmi_tbl.htm

Reliability of BMI an Indicator of Body Fatness

The correlation between the BMI number and body fatness is fairly strong; however the correlation varies by sex, race, and age. These variations include the following examples:

- At the same BMI, women tend to have more body fat than men.
- At the same BMI, older people, on average, tend to have more body fat than younger adults.
- Highly trained athletes may have a high BMI because of increased muscularity rather than increased body fatness.

It is also important to remember that BMI is only one factor related to risk for disease. For assessing someone's likelihood of developing overweight- or obesity-related diseases, the National Heart, Lung, and Blood Institute guidelines recommend looking at two other predictors:

- The individual's waist circumference (because abdominal fat is a predictor of risk for obesity-related diseases).

- Other risk factors the individual has for diseases and conditions associated with obesity (for example, high blood pressure or physical inactivity).

Measuring Waist Circumference

Measuring waist circumference helps screen for possible health risks that come with overweight and obesity. If most of your fat is around your waist rather than at your hips, you're at a higher risk for heart disease and type 2 diabetes. This risk goes up with a waist size that is greater than 35 inches for women or greater than 40 inches for men. To correctly measure your waist, stand and place a tape measure around your middle, just above your hipbones. Measure your waist just after you breathe out.

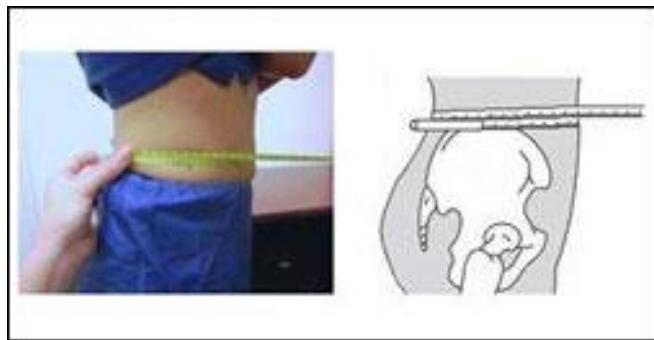


Figure 3. Measuring Waist Circumference

Interpreting BMI for Teens and Children

Although the BMI number is calculated the same way for children and adults, the criteria used to interpret the meaning of the BMI number for children and teens are different from those used for adults. For children and teens, BMI age- and sex-specific percentiles are used for two reasons:

- The amount of body fat changes with age.
- The amount of body fat differs between girls and boys.

Because of these factors, the interpretation of BMI is both age- and sex-specific for children and teens. The CDC BMI-for-age growth charts take into account these differences and allow translation of a BMI number into a percentile for a child's sex and age.

For adults, on the other hand, BMI is interpreted through categories that are not dependent on sex or age.

Section 10.2 Factors Contributing to Overweight and Obesity

Environmental Factors

The overall environment in which many Americans now live, work, learn, and play has contributed to the obesity epidemic. Ultimately, individuals choose the type and amount of food they eat and how physically active they are. However, choices are often limited by

what is available in a person's environment, including stores, restaurants, schools, and worksites. Environment affects both sides of the calorie balance equation—it can promote over-consumption of calories and discourage physical activity and calorie expenditure. The food supply has changed dramatically over the past 40 years. Foods available for consumption increased in all major food categories from 1970 to 2008. Average daily calories available per person in the marketplace increased approximately 600 calories, with the greatest increases in the availability of added fats and oils, grains, milk and milk products, and caloric sweeteners. Many portion sizes offered for sale also have increased. Research has shown that when larger portion sizes are served, people tend to consume more calories. In addition, strong evidence shows that portion size is associated with body weight, such that being served and consuming smaller portions is associated with weight loss.

Studies examining the relationship between the food environment and BMI have found that communities with a larger number of fast food or quick-service restaurants tend to have higher BMIs. Since the 1970s, the number of fast food restaurants has more than doubled. Further, the proportion of daily calorie intake from foods eaten away from home has increased, and evidence shows that children, adolescents, and adults who eat out, particularly at fast food restaurants, are at increased risk of weight gain, overweight, and obesity. The strongest association between fast food consumption and obesity is when one or more fast food meals are consumed per week. As a result of the changing food environment, individuals need to deliberately make food choices, both at home and away from home, that are nutrient dense, low in calories, and appropriate in portion size. On the other side of the calorie balance equation, many Americans spend most of their waking hours engaged in sedentary behaviors, making it difficult for them to expend enough calories to maintain calorie balance. Many home, school, work, and community environments do not facilitate a physically active lifestyle. For example, the lack of sidewalks or parks and concerns for safety when outdoors can reduce the ability of individuals to be physically active.

Also, over the past several decades, transportation and technological advances have meant that people now expend fewer calories to perform tasks of everyday life. Consequently, many people today need to make a special effort to be physically active during leisure time to meet physical activity needs. Unfortunately, levels of leisure-time physical activity are low. Approximately one-third of American adults report that they participate in leisure-time physical activity on a regular basis, one-third participate in some leisure-time physical activity, and one-third are considered inactive. Participation in physical activity also declines with age. For example, in national surveys using physical activity monitors, 42 percent of children ages 6 to 11 years participate in 60 minutes of physical activity each day, whereas only 8 percent of adolescents achieve this goal. Less than 5 percent of adults participate in 30 minutes of physical activity each day, with slightly more meeting the recommended weekly goal of at least 150 minutes.

Genetic Influences

Obesity is a complex multifactorial chronic disease developing from interactive influences of numerous factors—social, behavioral, physiological, metabolic, cellular, and molecular.

Genetic influences are difficult to explain and identification of the genes is not easily achieved through studies. Furthermore, whatever the influence the genotype has on the etiology of obesity, it is generally attenuated or exacerbated by nongenetic factors. A large number of twin, adoption, and family studies have explored the level of heritability of obesity; that is, the fraction of the population variation in a trait (e.g., BMI) that can be explained by genetic transmission. Recent studies of individuals with a wide range of BMIs, together with information obtained on their parents, siblings, and spouses, suggest that about 25 to 40 percent of the individual differences in body mass or body fat may depend on genetic factors. However, studies with identical twins reared apart suggest that the genetic contribution to BMI may be higher, i.e., about 70 percent.

Hormonal Influences

From the research currently available, several genes seem to have the capacity to cause obesity or to increase the likelihood of becoming obese. Leptin and ghrelin are two hormones that have been recognized to have a major influence on energy balance. Leptin is a mediator of long-term regulation of energy balance, suppressing food intake and thereby inducing weight loss. Ghrelin on the other hand is a fast-acting hormone, seemingly playing a role in meal initiation. As a growing number of people suffer from obesity, understanding the mechanisms by which various hormones and neurotransmitters have influence on energy balance has been a subject of intensive research. In obese subjects the circulating level of the anorexigenic hormone leptin is increased, whereas surprisingly, the level of the orexigenic hormone ghrelin is decreased. It is now established that obese patients are leptin-resistant. However, the manner in which both the leptin and ghrelin systems contribute to the development or maintenance of obesity is as of yet not clear.

Metabolic Rates

Numerous aspects of your metabolism play a role in determining whether you lose, gain, or maintain your weight. We all have a distinctive ability to burn energy called basal metabolic rate (BMR). BMR is the minimal rate of energy expenditure the body uses in order to survive and main vital functions in the body. Resting metabolic rate (RMR) takes into account BMR and any additional energy used during activities of daily living such as eating, digestion, sitting, or standing. Exercise metabolic rate (EMR) refers to the energy that is expended during exercise/physical activity. A person's metabolic rates can change throughout one's lifespan and can be affected by puberty, hormonal changes, age, physical activity. Unfortunately, our metabolism naturally slows down as we age making it much more difficult to lose weight at middle age. A slower metabolism, combined with age related muscle loss known as sarcopenia, family obligations, and long work hours all contribute to gradual weight gain in middle-aged adults.

Current Dietary Intake

The current dietary intake of Americans has contributed to the obesity epidemic. Many children and adults have a usual calorie intake that exceeds their daily needs, and they are not physically active enough to compensate for these intakes. The combination sets them

on a track to gain weight. On the basis of national survey data, the average calorie intake among women and men older than age 19 years are estimated to be 1,785 and 2,640 calories per day, respectively. While these estimates do not appear to be excessive, the numbers are difficult to interpret because survey respondents, especially individuals who are overweight or obese, often underreport dietary intake. Well-controlled studies suggest that the actual number of calories consumed may be higher than these estimates.

Sources of Calories

Table 3 provides the top sources of calories among Americans ages 2 years and older. The table reveals some expected differences in intake between younger (ages 2 to 18 years) and adult (ages 19 years and older) Americans. For example, alcoholic beverages are a major calorie source for adults, while fluid milk provides a greater contribution to calorie intake for children and adolescents. Further, while not shown in the table, there is additional variability in calorie sources among children, adolescents, and adults of different ages. For example, sugar-sweetened beverages and pizza are greater calorie contributors for those ages 9 to 18 years than for younger children. Also, dairy desserts and ready-to-eat cereals provide a greater contribution to calorie intake for those ages 71 years and older than they do among younger adults.

Although some of the top calorie sources by category are important sources of essential nutrients, others provide calories with few essential nutrients. Many of the foods and beverages most often consumed within these top categories are in forms high in solid fats and/or added sugars, thereby contributing excess calories to the diet. For example, many grain-based desserts are high in added sugars and solid fats, while many chicken dishes are both breaded and fried, which adds a substantial number of calories to the chicken.

Table 1. Top 25 Sources of Calories Among Americans Ages 2 Years and Older, NHANES 2005–2006a

rank	overall, ages 2+ yrs (Mean kcal/d; total daily calories = 2,157)	children and adolescents, ages 2–18 yrs (Mean kcal/d; total daily calories = 2,027)	adults and older adults, ages 19+ yrs (Mean kcal/d; total daily calories = 2,199)
1	Grain-based dessertsb (138 kcal)	Grain-based desserts (138 kcal)	Grain-based desserts (138 kcal)
2	Yeast breadsc (129 kcal)	Pizza (136 kcal)	Yeast breads (134 kcal)
3	Chicken and chicken mixed dishesd (121 kcal)	Soda/energy/sports drinks (118 kcal)	Chicken and chicken mixed dishes (123 kcal)
4	Soda/energy/sports drinkse (114 kcal)	Yeast breads (114 kcal)	Soda/energy/sport s drinks (112 kcal)
5	Pizza (98 kcal)	Chicken and chicken mixed dishes (113 kcal)	Alcoholic beverages (106 kcal)

6	Alcoholic beverages (82 kcal)	Pasta and pasta dishes (91 kcal)	Pizza (86 kcal)
7	Pasta and pasta dishesf (81 kcal)	Reduced fat milk (86 kcal)	Tortillas, burritos, tacos (85 kcal)
8	Tortillas, burritos, tacosg (80 kcal)	Dairy desserts (76 kcal)	Pasta and pasta dishes (78 kcal)
9	Beef and beef mixed dishesh (64 kcal)	Potato/corn/other chips (70 kcal)	Beef and beef mixed dishes (71 kcal)
10	Dairy dessertsi (62 kcal)	Ready-to-eat cereals (65 kcal)	Dairy desserts (58 kcal)
11	Potato/corn/other chips (56 kcal)	Tortillas, burritos, tacos (63 kcal)	Burgers (53 kcal)
12	Burgers (53 kcal)	Whole milk (60 kcal)	Regular cheese (51 kcal)
13	Reduced fat milk (51 kcal)	Candy (56 kcal)	Potato/corn/other chips (51 kcal)
14	Regular cheese (49 kcal)	Fruit drinks (55 kcal)	Sausage, franks, bacon, and ribs (49 kcal)
15	Ready-to-eat cereals (49 kcal)	Burgers (55 kcal)	Nuts/seeds and nut/seed mixed dishes (47 kcal)
16	Sausage, franks, bacon, and ribs (49 kcal)	Fried white potatoes (52 kcal)	Fried white potatoes (46 kcal)
17	Fried white potatoes (48 kcal)	Sausage, franks, bacon, and ribs (47 kcal)	Ready-to-eat cereals (44 kcal)
18	Candy (47 kcal)	Regular cheese (43 kcal)	Candy (44 kcal)
19	Nuts/seeds and nut/seed mixed dishesj (42 kcal)	Beef and beef mixed dishes (43 kcal)	Eggs and egg mixed dishes (42 kcal)
20	Eggs and egg mixed dishesk (39 kcal)	100% fruit juice, not orange/grapefruit (35 kcal)	Rice and rice mixed dishes (41 kcal)
21	Rice and rice mixed dishesl (36 kcal)	Eggs and egg mixed dishes (30 kcal)	Reduced fat milk (39 kcal)
22	Fruit drinksm (36 kcal)	Pancakes, waffles, and French toast (29 kcal)	Quickbreads (36 kcal)
23	Whole milk (33 kcal)	Crackers (28 kcal)	Other fish and fish mixed disheso (30 kcal)
24	Quickbreadsn (32 kcal)	Nuts/seeds and nut/seed mixed dishes (27 kcal)	Fruit drinks (29 kcal)
25	Cold cuts (27 kcal)	Cold cuts (24 kcal)	Salad dressing (29 kcal)

a. Data are drawn from analyses of usual dietary intakes

g. Also includes nachos,

conducted by the National Cancer Institute. Foods and beverages consumed were divided into 97 categories and ranked according to calorie contribution to the diet. Table shows each food category and its mean calorie contribution for each age group. Additional information on calorie contribution by age, gender, and race/ethnicity is available at <http://riskfactor.cancer.gov/diet/foodsources/>.

- b. Includes cake, cookies, pie, cobbler, sweet rolls, pastries, and donuts.
- c. Includes white bread or rolls, mixed-grain bread, flavored bread, whole-wheat bread, and bagels.
- d. Includes fried or baked chicken parts and chicken strips/patties, chicken stir-fries, chicken casseroles, chicken sandwiches, chicken salads, stewed chicken, and other chicken mixed dishes.
- e. Sodas, energy drinks, sports drinks, and sweetened bottled water including vitamin water.
- f. Includes macaroni and cheese, spaghetti, other pasta with or without sauces, filled pasta (e.g., lasagna and ravioli), and noodles.

quesadillas, and other Mexican mixed dishes.

h. Includes steak, meatloaf, beef with noodles, and beef stew.

i. Includes ice cream, frozen yogurt, sherbet, milk shakes, and pudding. j. Includes peanut butter, peanuts, and mixed nuts.

k. Includes scrambled eggs, omelets, fried eggs, egg breakfast sandwiches/biscuits, boiled and poached eggs, egg salad, deviled eggs, quiche, and egg substitutes.

l. Includes white rice, Spanish rice, and fried rice.

m. Includes fruit-flavored drinks, fruit juice drinks, and fruit punch. n. Includes muffins, biscuits, and cornbread.

o. Fish other than tuna or shrimp.

Source: National Cancer Institute. Food sources of energy among U.S. population, 2005-2006. Risk Factor Monitoring and Methods. Control and Population Sciences. National Cancer Institute; 2010. <http://riskfactor.cancer.gov/diet/foodsources/>. Updated May 21, 2010. Accessed May 21, 2010.

Section 10.3 Balancing Calories and Eating Healthfully

Calorie Balance: Food and Beverage Intake

Controlling calorie intake from foods and beverages is fundamental to achieving and attaining calorie balance. Understanding calorie needs, knowing food sources of calories, and recognizing associations between foods and beverages and higher or lower body weight are all important concepts when building an eating pattern that promotes calorie balance and weight management. Many Americans are unaware of how many calories they need each day or the calorie content of foods and beverages.

Understanding Calories Needs

The total number of calories a person needs each day varies depending on a number of factors, including the person's age, gender, height, weight, and level of physical activity. In addition, a desire to lose, maintain, or gain weight affects how many calories should be consumed. Estimates range from 1,600 to 2,400 calories per day for adult women and 2,000 to 3,000 calories per day for adult men, depending on age and physical activity level. Within each age and gender category, the low end of the range is for sedentary individuals; the high end of the range is for active individuals. Due to reductions in basal metabolic rate that occurs with aging, calorie needs generally decrease for adults as they age. Estimated needs for young children range from 1,000 to 2,000 calories per day, and the range for older children and adolescents varies substantially from 1,400 to 3,200 calories per day, with boys generally having higher calorie needs than girls. These are only estimates, and more accurate calorie needs may be determined using the Harris Benedict Equation shown below:

- **Step 1 – Calculating the Harris–Benedict BMR**

The original Harris–Benedict equations published in 1918 and 1919.

BMR calculation for men	$BMR = 66 + (6.2 \times \text{weight in pounds}) + (12.7 \times \text{height in inches}) - (6.76 \times \text{age in years})$
BMR calculation for women	$BMR = 655 + (4.35 \times \text{weight in pounds}) + (4.7 \times \text{height in inches}) - (4.7 \times \text{age in years})$

- **Step 2 – Determine Recommended Intake**

The following table enables calculation of an individual's recommended daily kilocalorie intake to maintain current weight.^[4]

Little to no exercise	Daily kilocalories needed = BMR x 1.2
Light exercise (1–3 days per week)	Daily kilocalories needed = BMR x 1.375
Moderate exercise (3–5 days per week)	Daily kilocalories needed = BMR x

	1.55
Heavy exercise (6–7 days per week)	Daily kilocalories needed = BMR x 1.725
Very heavy exercise (twice per day, extra heavy workouts)	Daily kilocalories needed = BMR x 1.9

Knowing one's daily calorie needs may be a useful reference point for determining whether the calories that a person eats and drinks are appropriate in relation to the number of calories needed each day. The best way for people to assess whether they are eating the appropriate number of calories is to monitor body weight and adjust calorie intake and participation in physical activity based on changes in weight over time. A calorie deficit of 500 calories or more per day is a common initial goal for weight loss for adults. However, maintaining a smaller deficit can have a meaningful influence on body weight over time. The effect of a calorie deficit on weight does not depend on how the deficit is produced—by reducing calorie intake, increasing expenditure, or both. Yet, in research studies, a greater proportion of the calorie deficit is often due to decreasing calorie intake with a relatively smaller fraction due to increased physical activity.

*Table 2. Estimated Calorie Needs Per Day By Age, Gender, and Physical Activity Level**

Estimated amounts of calories needed to maintain calorie balance for various gender and age groups at three different levels of physical activity. The estimates are rounded to the nearest 200 calories. An individual's calorie needs may be higher or lower than these average estimates.

		Physical activity level*		
gender	age (years)	sedentary	Moderately active	active
child (female and male)	2–3	1,000–1,200c	1,000–1,400c	1,000–1,400c
female	4–8	1,200–1,400	1,400–1,600	1,400–1,800
	9–13	1,400–1,600	1,600–2,000	1,800–2,200
	14–18	1,800	2,000	2,400
	19–30	1,800–2,000	2,000–2,200	2,400
	31–50	1,800	2,000	2,200
	51+	1,600	1,800	2,000–2,200
male	4–8	1,200–1,400	1,400–1,600	1,600–2,000
	9–13	1,600–2,000	1,800–2,200	2,000–2,600
	14–18	2,000–2,400	2,400–2,800	2,800–3,200
	19–30	2,400–2,600	2,600–2,800	3,000

31–50	2,200–2,400	2,400–2,600	2,800–3,000
51+	2,000–2,200	2,200–2,400	2,400–2,800

- a. Based on Estimated Energy Requirements (EER) equations, using reference heights (average) and reference weights (healthy) for each age/gender group. For children and adolescents, reference height and weight vary. For adults, the reference man is 5 feet 10 inches tall and weighs 154 pounds. The reference woman is 5 feet 4 inches tall and weighs 126 pounds. EER equations are from the Institute of Medicine. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. Washington (DC): The National Academies Press; 2002.
- b. Sedentary means a lifestyle that includes only the light physical activity associated with typical day-to-day life. Moderately active means a lifestyle that includes physical activity equivalent to walking about 1.5 to 3 miles per day at 3 to 4 miles per hour, in addition to the light physical activity associated with typical day-to-day life. Active means a lifestyle that includes physical activity equivalent to walking more than 3 miles per day at 3 to 4 miles per hour, in addition to the light physical activity associated with typical day-to-day life.
- c. The calorie ranges shown are to accommodate needs of different ages within the group. For children and adolescents, more calories are needed at older ages. For adults, fewer calories are needed at older ages.
- d. Estimates for females do not include women who are pregnant or breastfeeding.

Macronutrient Proportions

The Institute of Medicine has established ranges for the percentage of calories in the diet that should come from carbohydrate, protein, and fat. These Acceptable Macronutrient Distribution Ranges (AMDR) take into account both chronic disease risk reduction and intake of essential nutrients (Table 5).

To manage body weight, Americans should consume a diet that has an appropriate total number of calories and that is within the AMDR. Strong evidence shows that there is no optimal proportion of macronutrients that can facilitate weight loss or assist with maintaining weight loss. Although diets with a wide range of macronutrient proportions have been documented to promote weight loss and prevent weight regain after loss, evidence shows that the critical issue is not the relative proportion of macronutrients in the diet, but whether or not the eating pattern is reduced in calories and the individual is able to maintain a reduced-calorie intake over time. The total number of calories consumed is the essential dietary factor relevant to body weight. In adults, moderate evidence suggests that diets that are less than 45 percent of total calories as carbohydrate or more than 35 percent of total calories as protein are generally no more effective than other calorie-controlled diets for long-term weight loss and weight maintenance. Therefore, individuals who wish to lose weight or maintain weight loss can select eating patterns that maintain appropriate calorie intake and have macronutrient proportions that are within the AMDR ranges recommended in the Dietary Reference Intakes.

Individual Foods and Beverages and Body Weight

For calorie balance, the focus should be on total calorie intake, but intake of some foods and beverages that are widely over- or under consumed has been associated with effects on body weight. In studies that have held total calorie intake constant, there is little evidence that any individual food groups or beverages have a unique impact on body weight.

Although total calorie intake is ultimately what affects calorie balance, some foods and beverages can be easily overconsumed, which results in a higher total calorie intake. As individuals vary a great deal in their dietary intake, the best advice is to monitor dietary intake and replace foods higher in calories with nutrient-dense foods and beverages relatively low in calories. The following guidance may help individuals control their total calorie intake and manage body weight:

- increase intake of whole grains, vegetables, and fruits: Moderate evidence shows that adults who eat more whole grains, particularly those higher in dietary fiber, have a lower body weight compared to adults who eat fewer whole grains. Moderate evidence in adults and limited evidence in children and adolescents suggests that increased intake of vegetables and/or fruits may protect against weight gain.
- reduce intake of sugar-sweetened beverages: This can be accomplished by drinking fewer sugar-sweetened beverages and/or consuming smaller portions. Strong evidence shows that children and adolescents who consume more sugar-sweetened beverages have higher body weight compared to those who drink less, and moderate evidence also supports this relationship in adults. Sugar-sweetened beverages provide excess calories and few essential nutrients to the diet and should only be consumed when nutrient needs have been met and without exceeding daily calorie limits.
- Monitor intake of 100% fruit juice for children and adolescents, especially those who are over-weight or obese: For most children and adolescents, intake of 100% fruit juice is not associated with body weight. However, limited evidence suggests that increased intake of 100% juice has been associated with higher body weight in children and adolescents who are overweight or obese.
- Monitor calorie intake from alcoholic beverages for adults: Moderate evidence suggests that moderate drinking of alcoholic beverages is not associated with weight gain. However, heavier than moderate consumption of alcohol over time is associated with weight gain. Because alcohol is often consumed in mixtures with other beverages, the calorie content of accompanying mixers should be considered when calculating the calorie content of alcoholic beverages. Reducing alcohol intake is a strategy that can be used by adults to consume fewer calories.

Strong evidence in adults and moderate evidence in children and adolescents demonstrates that consumption of milk and milk products does not play a special role in weight management. Evidence also suggests that there is no independent relationship between the intake of meat and poultry or beans and peas, including soy, with body weight. Although not independently related to body weight, these foods are important sources of nutrients in healthy eating patterns.

Table 3. Recommended Macronutrient Proportions by Age

	carbohydrate	Protein	fat
Young children (1–3 years)	45–65%	5–20%	30–40%

Older children and adolescents (4–18 years)	45–65%	10–30%	25–35%
Adults (19 years and older)	45–65%	10–35%	20–35%

Source: Institute of Medicine. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. Washington (DC): The National Academies Press; 2002.

Developing Healthy Eating Patterns

Because people consume a variety of foods and beverages throughout the day as meals and snacks, a growing body of research has begun to describe overall eating patterns that help promote calorie balance and weight management. One aspect of these patterns that has been researched is the concept of calorie density, or the amount of calories provided per unit of food weight. Foods high in water and/or dietary fiber typically have fewer calories per gram and are lower in calorie density, while foods higher in fat are generally higher in calorie density. A dietary pattern low in calorie density is characterized by a relatively high intake of vegetables, fruit, and dietary fiber and a relatively low intake of total fat, saturated fat, and added sugars. Strong evidence shows that eating patterns that are low in calorie density improve weight loss and weight maintenance, and also may be associated with a lower risk of type 2 diabetes in adults.

Although total calories consumed is important for calorie balance and weight management, it is important to consider the nutrients and other healthful properties of food and beverages, as well as their calories, when selecting an eating pattern for optimal health. When choosing carbohydrates, Americans should emphasize naturally occurring carbohydrates, such as those found in whole grains, beans and peas, vegetables, and fruits, especially those high in dietary fiber, while limiting refined grains and intake of foods with added sugars. Glycemic index and glycemic load have been developed as measures of the effects of carbohydrate-containing foods and beverages on blood sugar levels. Strong evidence shows that glycemic index and/or glycemic load are not associated with body weight; thus, it is not necessary to consider these measures when selecting carbohydrate foods and beverages for weight management. For protein, plant-based sources and/or animal-based sources can be incorporated into a healthy eating pattern. However, some protein products, particularly some animal-based sources, are high in saturated fat, so non-fat, low-fat, or lean choices should be selected. Fat intake should emphasize monounsaturated and polyunsaturated fats, such as those found in seafood, nuts, seeds, and oils.

Americans should move toward more healthful eating patterns. Overall, as long as foods and beverages consumed meet nutrient needs and calorie intake is appropriate, individuals can select an eating pattern that they enjoy and can maintain over time. Individuals should consider the calories from all foods and beverages they consume, regardless of when and where they eat or drink.

Calorie Balance: Physical Activity

Physical activity is the other side of the calorie balance equation and should be considered when addressing weight management. In 2008, the U.S. Department of Health and Human Services released a comprehensive set of physical activity recommendations for Americans ages 6 years and older. Weight management along with health outcomes, including premature (early) death, diseases (such as coronary heart disease, type 2 diabetes, and osteoporosis), and risk factors for disease (such as high blood pressure and high blood cholesterol) were among the outcomes considered in developing the Physical Activity Guidelines for Americans. Getting adequate amounts of physical activity conveys many health benefits independent of body weight.

Strong evidence supports that regular participation in physical activity also helps people maintain a healthy weight and prevent excess weight gain. Further, physical activity, particularly when combined with reduced calorie intake, may aid weight loss and maintenance of weight loss. Decreasing time spent in sedentary behaviors also is important as well. Strong evidence shows that more screen time, particularly television viewing, is associated with overweight and obesity in children, adolescents, and adults. Substituting active pursuits for sedentary time can help people manage their weight and provides other health benefits.

The Physical Activity Guidelines for Americans provides guidance to help Americans improve their health, including weight management, through appropriate physical activity. The amount of physical activity necessary to successfully maintain a healthy body weight depends on calorie intake and varies considerably among adults, including older adults. To achieve and maintain a healthy body weight, adults should do the equivalent of 150 minutes of moderate-intensity aerobic activity each week. If necessary, adults should increase their weekly minutes of aerobic physical activity gradually over time and decrease calorie intake to a point where they can achieve calorie balance and a healthy weight. Some adults will need a higher level of physical activity than others to achieve and maintain a healthy body weight. Some may need more than the equivalent of 300 minutes per week of moderate-intensity activity.

For children and adolescents ages 6 years and older, 60 minutes or more of physical activity per day is recommended. Although the Physical Activity Guidelines do not include a specific quantitative recommendation for children ages 2 to 5 years, young children should play actively several times each day. Children and adolescents are often active in short bursts of time rather than for sustained periods of time, and these short bursts can add up to meet physical activity needs. Physical activities for children and adolescents of all ages should be developmentally appropriate and enjoyable, and should offer variety.

Principles for Promoting Calorie Balance and Weight Management

To address the current calorie imbalance in the United States, individuals are encouraged to become more conscious of what they eat and what they do. This means increasing awareness of what, when, why, and how much they eat, deliberately making better choices

regarding what and how much they consume, and seeking ways to be more physically active. Several behaviors and practices have been shown to help people manage their food and beverage intake and calorie expenditure and ultimately manage body weight. The behaviors with the strongest evidence related to body weight include:

- Focus on the total number of calories consumed. Maintaining a healthy eating pattern at an appropriate calorie level within the AMDR is advisable for weight management. Consuming an eating pattern low in calorie density may help to reduce calorie intake and improve body weight outcomes and overall health.
- Monitor food intake. Monitoring intake has been shown to help individuals become more aware of what and how much they eat and drink. The Nutrition Facts label found on food packaging provides calorie information for each serving of food or beverage and can assist consumers in monitoring their intake. Also, monitoring body weight and physical activity can help prevent weight gain and improve outcomes when actively losing weight or maintaining body weight following weight loss.
- When eating out, choose smaller portions or lower-calorie options. When possible, order a small-sized option, share a meal, or take home part of the meal. Review the calorie content of foods and beverages offered and choose lower-calorie options. Calorie information may be available on menus, in a pamphlet, on food wrappers, or online. Or, instead of eating out, cook and eat more meals at home.
- Prepare, serve, and consume smaller portions of foods and beverages, especially those high in calories. Individuals eat and drink more when provided larger portions. Serving and consuming smaller portions is associated with weight loss and weight maintenance over time.
- Eat a nutrient-dense breakfast. Not eating breakfast has been associated with excess body weight, especially among children and adolescents. Consuming breakfast also has been associated with weight loss and weight loss maintenance, as well as improved nutrient intake.
- Limit screen time. In children, adolescents, and adults, screen time, especially television viewing, is directly associated with increased overweight and obesity. Children and adolescents are encouraged to spend no more than 1 to 2 hours each day watching television, playing electronic games, or using the computer (other than for homework). Also, avoid eating while watching television, which can result in overeating.

Research has investigated additional principles that may promote calorie balance and weight management. However, the evidence for these behaviors is not as strong. Some evidence indicates that beverages are less filling than solid foods, such that the calories from beverages may not be offset by reduced intake of solid foods, which can lead to higher total calorie intake. In contrast, soup, particularly broth or water-based soups, may lead to decreased calorie intake and body weight over time. Further, replacing added sugars with non-caloric sweeteners may reduce calorie intake in the short-term, yet questions remain about their effectiveness as a weight management strategy. Other behaviors have been

studied, such as snacking and frequency of eating, but there is currently not enough evidence to support a specific recommendation for these behaviors to help manage body weight.

Although obesity is related to many chronic health conditions, it is not the only lifestyle-related public health problem confronting the Nation. Eating patterns that are high in calories, but low in nutrients can leave a person overweight but malnourished.

Nutritionally unbalanced diets can negatively affect a person's health regardless of weight status. Such diets are related to many of the most common and costly health problems in the United States, particularly heart disease and its risk factors and type 2 diabetes.

Similarly, a sedentary lifestyle increases risk of these diseases. Improved eating patterns and increased physical activity have numerous health benefits beyond maintaining a healthy weight. Improved nutrition, appropriate eating behaviors, and increased physical activity have tremendous potential to decrease the prevalence of overweight and obesity, enhance the public's health, reduce morbidity and premature mortality, and reduce health care costs.

Section 10.4 Body Image

One of the greatest difficulties we have as a society is achieving and maintaining a healthy weight, while also maintaining a healthy body image. Body image is how you see yourself when you look in the mirror or when you picture yourself in your mind. It encompasses:

- What you believe about your own appearance (including your memories, assumptions, and generalizations).
- How you feel about your body, including your height, shape, and weight.
- How you sense and control your body as you move. How you feel in your body, not just about your body.

Below are examples of negative and positive body image:

Negative Body Image

- A distorted perception of your shape--you perceive parts of your body unlike they really are.
- You are convinced that only other people are attractive and that your body size or shape is a sign of personal failure.
- You feel ashamed, self-conscious, and anxious about your body.
- You feel uncomfortable and awkward in your body.

Positive Body Image

- A clear, true perception of your shape--you see the various parts of your body as they really are.
- You celebrate and appreciate your natural body shape and you understand that a person's physical appearance says very little about their character and value as a person.
- You feel proud and accepting of your unique body and refuse to spend an unreasonable amount of time worrying about food, weight, and calories.
- You feel comfortable and confident in your body.

We all may have our days when we feel awkward or uncomfortable in our bodies, but the key to developing positive body image is to recognize and respect our natural shape and learn to overpower those negative thoughts and feelings with positive, affirming, and accepting ones. For more information you can visit the website for the National Eating Disorder Association. Their message is simple: **Accept yourself. Accept your body.**

Eating Disorders

People with negative body image have a greater likelihood of developing an eating disorder and are more likely to suffer from feelings of depression, isolation, low self-esteem, and obsessions with weight loss.

Anorexia nervosa, or anorexia, is a type of eating disorder that mainly affects adolescent girls and young women, but can also affect men. A person with this disease has an intense fear of gaining weight and severely limits food intake. Individual may:

- Have a low body weight
- Refuse to keep a normal body weight
- Be extremely afraid of becoming fat
- Believe they are fat even if they are very thin
- Women may miss three (menstrual) periods in a row (for girls/women who have started having their periods)

Anorexia affects your health because it can damage many parts of your body. A person with anorexia will have many of these signs:

- Loses a lot of weight
- Talks about weight and food all the time
- Moves food around the plate; doesn't eat it
- Weighs food and counts calories
- Follows a strict diet
- Won't eat in front of others
- Ignores/denies hunger
- Uses extreme measures to lose weight (self-induced vomiting, laxative abuse, diuretic abuse, diet pills, fasting, excessive exercise)
- Thinks she's fat when she's too thin
- Gets sick a lot
- Weighs self several times a day
- Feels depressed
- Feels irritable
- Doesn't socialize
- Wears baggy clothes to hide appearance

A health care team of doctors, nutritionists, and therapists will help the patient get better. They will:

- Help bring the person back to a normal weight
- Treat any psychological issues related to anorexia

- Help the person get rid of any actions or thoughts that cause the eating disorder

Some research suggests that the use of medicines — such as antidepressants, antipsychotics, or mood stabilizers — may sometimes work for anorexic patients. It is thought that these medicines help the mood and anxiety symptoms that often co-exist with anorexia. Other recent studies, however, suggest that antidepressants may not stop some patients with anorexia from relapsing. Also, no medicine has shown to work 100 percent of the time during the important first step of restoring a patient to healthy weight. So, it is not clear if and how medications can help anorexic patients get better, but research is still in progress.

Some forms of psychotherapy can help make the psychological reasons for anorexia better. Psychotherapy is sometimes known as "talk therapy." It uses different ways of communicating to change a patient's thoughts or behavior. This kind of therapy can be useful for treating eating disorders in young patients who have not had anorexia for a long time.

Individual counseling can help someone with anorexia. If the patient is young, counseling may involve the whole family. Support groups may also be a part of treatment. In support groups, patients, and families meet and share what they've been through.

Some researchers point out that prescribing medicines and using psychotherapy designed just for anorexic patients works better at treating anorexia than just psychotherapy alone. Whether or not a treatment works, though, depends on the person involved and his or her situation. Unfortunately, no one kind of psychotherapy always works for treating adults with anorexia.

Bulimia Nervosa

Bulimia nervosa, or bulimia, is a type of eating disorder. Someone with bulimia eats a lot of food in a short amount of time (bingeing) and then tries to get rid of the calories by purging. Purging might be done in these ways:

- Making oneself throw up
- Taking laxatives (pills or liquids that increase how fast food moves through your body and leads to a bowel movement)

A person with bulimia may also use these ways to prevent weight gain:

- Exercising a lot (more than normal)
- Restricting her eating or not eating at all (like going without food for a day)
- Taking diuretics (pills that make you urinate)

Bulimia is more than just a problem with food. It's a way of using food to feel in control of other feelings that may seem overwhelming. Purging and other behaviors to prevent weight gain are ways for people with bulimia to feel more in control of their lives and to ease stress and anxiety.

Unlike anorexia, when people are severely underweight, people with bulimia may be underweight, overweight, or have a normal weight. This makes it harder to know if someone has this disease. However, someone with bulimia may have these signs:

- Thinks about food a lot

- Binges (normally in secret)
- Throws up after bingeing
- Uses laxatives, diet pills, or diuretics to control weight
- Is depressed
- Is unhappy and/or thinks a lot about her body shape and weight
- Eats large amounts of food quickly
- Goes to the bathroom all the time after she eats (to throw up)
- Exercises a lot, even during bad weather, fatigue, illness, or injury
- Unusual swelling of the cheeks or jaw area
- Cuts and calluses on the back of the hands and knuckles from making herself throw up
- White enamel of teeth wears away making teeth look clear
- Doesn't see friends or participate in activities as much. Has rules about food — has "good" foods and "bad" foods

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CHAPTER 11: Physical Fitness

Being physically active is one of the most important steps that Americans of all ages can take to improve their health. The benefits of physical activity occur in generally healthy people, in people at risk of developing chronic diseases, and in people with current chronic conditions or disabilities. Studies have examined the role of physical activity in many groups—men and women, children, teens, adults, older adults, people with disabilities, and women during pregnancy and the postpartum period. These studies have focused on the role that physical activity plays in many health outcomes, including:

- Premature (early) death;
- Diseases such as coronary heart disease, stroke, some cancers, type 2 diabetes, osteoporosis, and depression;
- Risk factors for disease, such as high blood pressure and high blood cholesterol;
- Physical fitness, such as **aerobic capacity**, and muscle **strength** and endurance
- Functional capacity (the ability to engage in activities needed for daily living);
- Mental health, such as depression and cognitive function; and
- Injuries or sudden heart attacks.

There have also been additional studies by the Advisory Committee of the U.S. Department of Health and Human Services. The Advisory Committee rated the evidence of health benefits of physical activity as strong, moderate, or weak. To do so, the Committee considered the type, number, and quality of studies available, as well as consistency of findings across studies that addressed each outcome.

The Committee also considered evidence for causality and dose response in assigning the strength-of-evidence rating.

Section 11.1 Health Benefits Associated with Regular Physical Activity

Table 1.

Health Benefits Associated with Regular Physical Activity in Children and Adolescents	
Strong Evidence	Moderate Evidence
<ul style="list-style-type: none"> • Improved cardiorespiratory and muscular fitness • Improved bone health • Improved cardiovascular and metabolic health biomarkers • Favorable body composition 	<ul style="list-style-type: none"> • Reduced symptoms of depression

Table 2

Health Benefits Associated with Regular Physical Activity in Adults and Older Adults		
Strong Evidence	Moderate to Strong Evidence	Moderate Evidence
<ul style="list-style-type: none"> • Lower risk of early death • Lower risk of coronary heart disease • Lower risk of stroke • Lower risk of high blood pressure • Lower risk of adverse blood lipid profile • Lower risk of type 2 diabetes • Lower risk of metabolic syndrome • Lower risk of colon cancer • Lower risk of breast cancer • Prevention of weight gain • Weight loss, particularly when combined with reduced calorie intake • Improved cardiorespiratory and muscular fitness • Prevention of falls • Reduced depression • Better cognitive function (for older adults) 	<ul style="list-style-type: none"> • Better functional health (for older adults) • Reduced abdominal obesity 	<ul style="list-style-type: none"> • Lower risk of hip fracture • Lower risk of lung cancer • Lower risk of endometrial cancer • Weight maintenance after weight loss • Increased bone density • Improved sleep quality

These studies have also prompted questions as to what type and how much physical activity is needed for various health benefits. That led to the development of [The Physical Activity Guidelines for Americans](#), which gives guidance on the amount of physical activity that will provide health benefits for all Americans. Although some health benefits seem to begin with as little as 60 minutes (1 hour) a week, research shows that a total amount of 150 minutes (2 hours and 30 minutes) a week of moderate-intensity aerobic activity, such as brisk walking, consistently reduces the risk of many chronic diseases and other adverse health outcomes. For more details on the Physical Activity Guidelines for Americans please see the table below:

Table 3

For Important Health Benefits Adults Need at Least:		
<p>2 hours and 30 minutes (150 minutes) of moderate aerobic activity every week (i.e., brisk walking) every week;</p> <p style="text-align: center;">OR</p> <p>1 hour and 15 minutes (75 minutes) of vigorous intensity aerobic activity (i.e., jogging or running) every week;</p> <p style="text-align: center;">OR</p> <p>An equivalent mix of moderate-and-vigorous-intensity aerobic activity</p>	AND	<p>Muscle-strengthening activities on 2 or more days a week that work all major muscle groups (legs hips, back, abdomen, chest, shoulders, and arms)</p>

Although the Guidelines focus on the health benefits of physical activity, these benefits are not the only reason why people are active. Physical activity gives people a chance to have fun, be with friends and family, enjoy the outdoors, improve their personal appearance, and improve their fitness so that they can participate in more intensive physical activity or sporting events. Some people are active because they feel it gives them certain health benefits (such as feeling more energetic) that aren't yet conclusively proven for the general population. The Guidelines encourage people to be physically active for any and all reasons that are meaningful for them. Nothing in the Guidelines is intended to mean that health benefits are the only reason to do physical activity.

Section 11.2 Health Related Components of Physical Fitness

In many studies related to physical fitness and health, researchers have focused on **exercise**, as well as on the more broadly defined concept of **physical activity**. Physical activity is defined by the World Health Organization as any bodily movement produced by skeletal muscles that requires energy expenditure, while exercise is a form of physical activity that is planned, structured, repetitive, and performed with the goal of improving health or fitness. So, although all exercise is physical activity, not all physical activity is exercise. Although physical activity and exercise are defined concepts, the ultimate focus of the health related components of physical fitness is to provide a framework for components that are necessary for good health. They are cardiorespiratory (CR) endurance (also called aerobic endurance), flexibility, muscular strength, muscular endurance, and body composition.

Cardiorespiratory Endurance

- **Aerobic endurance:** The ability of the heart, blood vessels, and lungs to work together to accomplish three goals: 1) deliver oxygen to body tissues; 2) deliver nutrients; 3) remove waste products. CR endurance exercises involve large muscle groups in prolonged, dynamic movement (ex. running, swimming, etc)

Table 4

Examples of Different Aerobic Physical Activities and Intensities	
Moderate Intensity	Vigorous Intensity
<ul style="list-style-type: none"> • Walking briskly (3 miles per hour or faster, but not race-walking) • Water aerobics • Bicycling slower than 10 miles per hour • Tennis (doubles) • Ballroom dancing • General gardening 	<ul style="list-style-type: none"> • Racewalking, jogging, or running • Swimming laps • Tennis (singles) • Aerobic dancing • Bicycling 10 miles per hour or faster • Jumping rope • Heavy gardening (continuous digging or hoeing, with heart rate increases) • Hiking uphill or with a heavy backpack

Frequency and Duration

Aerobic physical activity should preferably be spread throughout the week. Research studies consistently show that activity performed on at least 3 days a week produces health benefits. Spreading physical activity across at least 3 days a week may help to reduce the risk of injury and avoid excessive fatigue.

Both moderate- and vigorous-intensity aerobic activity should be performed in episodes of at least 10 minutes. Episodes of this duration are known to improve cardiovascular fitness and some risk factors for heart disease and type 2 diabetes.

Intensity

The *Guidelines* for adults focus on two levels of intensity: moderate-intensity activity and vigorous-intensity activity. To meet the Guidelines, adults can do either moderate-intensity or vigorous-intensity aerobic activities, or a combination of both. It takes less time to get the same benefit from vigorous-intensity activities as from moderate-intensity activities. A general rule of thumb is that 2 minutes of moderate-intensity activity counts the same as 1 minute of vigorous-intensity activity. For example, 30 minutes of moderate-intensity activity a week is roughly the same as 15 minutes of vigorous-intensity activity. A person doing moderate-intensity aerobic activity can talk, but not sing, during the activity. A person doing vigorous intensity activity cannot say more than a few words without pausing for a breath.

Muscular Strength and Endurance

- **Muscular strength:** The ability of muscles to exert maximal effort.
- **Muscular endurance:** The ability of muscles to exert submaximal effort repetitively (contract over and over again or hold a contraction for a long time).

Activities for Muscular Strength and Endurance

These kind of activities, which includes **resistance training** and lifting weights, causes the body's muscles to work or hold against an applied force or weight. These activities often involve relatively heavy objects, such as weights, which are lifted multiple times to train various muscle groups. Muscle-strengthening activity can also be done by using elastic bands or body weight for resistance (climbing a tree or doing push-ups, for example). Activities for Muscular Strength and Endurance also has three components:

- **Intensity**, or how much weight or force is used relative to how much a person is able to lift;
- **Frequency**, or how often a person does muscle strengthening activity; and
- **Repetitions**, or how many times a person lifts a weight (analogous to duration for aerobic activity). Repetitions play a key role in determining if an activity is improving muscular strength or endurance. Low repetitions with more weight will focus more on muscular strength, while high repetitions with less weight will focus

more on muscular endurance. The effects of muscle-strengthening activity are limited to the muscles doing the work. It's important to work all the major muscle groups of the body: the legs, hips, back, abdomen, chest, shoulders, and arms.

Muscle-strengthening activities provide additional benefits not found with aerobic activity. The benefits of muscle-strengthening activity include increased bone strength and muscular fitness. Muscle-strengthening activities can also help maintain muscle mass during a program of weight loss.

Muscle-strengthening activities make muscles do more work than they are accustomed to doing. That is, they overload the muscles. Resistance training, including weight training, is a familiar example of muscle-strengthening activity. Other examples include working with resistance bands, doing calisthenics that use body weight for resistance (such as push-ups, pull-ups, and sit-ups), carrying heavy loads, and heavy gardening (such as digging or hoeing).

Muscle-strengthening activities count if they involve a moderate to high level of intensity or effort and work the major muscle groups of the body: the legs, hips, back, chest, abdomen, shoulders, and arms. Muscle strengthening activities for all the major muscle groups should be done at least 2 days a week.

No specific amount of time is recommended for muscle strengthening, but muscle-strengthening exercises should be performed to the point at which it would be difficult to do another repetition without help. When resistance training is used to enhance muscle strength, one set of 8 to 12 repetitions of each exercise is effective, although two or three sets may be more effective. Development of muscle strength and endurance is progressive over time. Increases in the amount of weight or the days a week of exercising will result in stronger muscles.

Flexibility

Flexibility is the ability of moving a joint through the range of motion. Flexibility is an important part of physical fitness. Some types of physical activity, such as dancing, require more flexibility than others. Stretching exercises are effective in increasing flexibility, and thereby can allow people to more easily do activities that require greater flexibility. For this reason, flexibility activities are an appropriate part of a physical activity program, even though they have no known health benefits and it is unclear whether they reduce risk of injury. Time spent doing flexibility activities by themselves does not count toward meeting the aerobic or muscle-strengthening Guidelines. Although there are not specific national guidelines for flexibility, adults should do flexibility exercises at least two or three days each week to improve range of motion. This can be done by holding a stretch for 10-30 seconds to the point of tightness or slight discomfort. Repeat each stretch two to four times, accumulating 60 seconds per stretch.

Body composition

The percentage of the body composed of lean tissue (muscle, bone, fluids, etc.) and fat tissue. Changes in body composition usually occur as a result of improvements in the other components of health related physical fitness, as well as changes in eating habits. This is discussed in more detail in the Weight Management and Healthy Eating Chapter.

There are also other components of fitness related to sports performance rather than just health. They are called skill-related components of fitness or motor fitness and include power, speed, agility, balance, and coordination. For the purpose of this class we will focus mainly on the health-related components of fitness.

Section 11.3 Adding Physical Activity to Your Life

Overcoming Barrier to Being Physical Active

Given the health benefits of regular physical activity, we might have to ask why two out of three (60%) Americans are not active at recommended levels.

Many technological advances and conveniences that have made our lives easier and less active, as well as many personal variables, including physiological, behavioral, and psychological factors, may affect our plans to become more physically active. In fact, the 10 most common reasons adults cite for not adopting more physically active lifestyles are (Sallis and Hovell, 1990; Sallis et al., 1992):

- Do not have enough time to exercise
- Find it inconvenient to exercise
- Lack self-motivation
- Do not find exercise enjoyable
- Find exercise boring
- Lack confidence in their ability to be physically active (low self-efficacy)
- Fear being injured or have been injured recently
- Lack self-management skills, such as the ability to set personal goals, monitor progress, or reward progress toward such goals
- Lack encouragement, support, or companionship from family and friends, and
- Do not have parks, sidewalks, bicycle trails, or safe and pleasant walking paths convenient to their homes or offices.

Understanding common barriers to physical activity and creating strategies to overcome them may help you make physical activity part of your daily life. Please visit the link below to see a full table of SUGGESTIONS FOR OVERCOMING PHYSICAL ACTIVITY BARRIERS:

<https://courses.candelalearning.com/fitness1xmaster/chapter/adding-physical-activity-to-your-life/>

Creating your own Fitness Program

The first step to implementing a fitness program is to identify your goals. As discussed in earlier chapters, goals should be specific, measurable, action-oriented, realistic and time-

bound (SMART). Progress can be difficult to track if goals are vague and open-ended, such as "*I will exercise more.*" Here is an example of a SMART goal for fitness:

- Specific: "*I will walk for 30 minutes a day 3-5 days per week*"
- Measurable: "*I will improve my resting heart rate over the next month*"
- Action-Oriented: "*I will research walking routes around my home and campus*"
- Realistic: "*I will increase my walking to 45 minutes per day in one month*"
- Time Bound: "*I will try this walking program for one month and then reassess my goals*"

You can also make a SMART Goal in one statement, such as "*I will walk for 30 minutes 3-5 days per week for the next month in order to improve my resting heart rate.*"

FITT Principle

Using the FITT principle is one way remember the guidelines for physical activity and create a prescription for improvement in your health-related physical fitness.

- **Frequency:** how often a person performs a health-related physical activity.
- **Intensity:** how hard a person exercises during a physical activity period. Intensity can be measured in different ways, depending on the related health-related component.
- **Time:** also known as duration. Refers to the amount of time or repetitions when performing a physical activity.
- **Type:** the kind of exercise or physical activity a person is performing.

Adapted from:

<http://www.ode.state.or.us/teachlearn/subjects/pe/curriculum/fittprinciple.pdf>

Table 5

	CARDIORESPIRATORY	FLEXIBILITY	MUSCULAR ENDURANCE	MUSCULAR STRENGTH
F Frequency	3-5 times per week Increase frequency as you get into better shape	Should be a regular part of your warm-up and cool-down Increase frequency as you get into better	Daily for some muscle groups Perform 3-4 times per week Increase frequency as you	Perform 3 times per week Different muscle groups each time you work out Increase

		shape	get into better shape	frequency as you get into better shape
I Intensity	50%-60% of heart rate reserve Increase intensity as you get into better shape	Stretch all major muscles and joints; hold for 15-30 seconds Perform 1-3 repetitions Increase intensity as you get into better shape	Less than 50% of your predicted 1-rep max Start with body weight then add resistance 15 or more reps/1-3 sets Increase intensity as you get into better shape	60%-80% of 1-rep max 8-12 reps / 1-3 sets Increase intensity as you get into better shape
T Time	20-60 minutes of continuous activity Increase the time as you get into better shape	10-20 minutes Increase the time as you get into better shape	30-60 minutes Increase the time as you get into better shape	15-60 minutes Increase the time as you get into better shape
T Type	Running, cycling, swimming, and activities that use large muscles	Perform static stretches and controlled dynamic stretches	Resistance training (body weight/tubing/medicine balls/free weights)	Resistance training (body weight/tubing/medicine balls/free weights)

Measuring Intensity

Target Heart Rate and Estimated Maximum Heart Rate

Exercise intensity can be measured using either heart rate or the rating of perceived exertion (RPE) method. We will look at each of these methods in turn. There are two methods of using heart rate to measure exercise intensity: the percentage of maximal heart rate method and the heart rate reserve (HRR), or karvonen method.

As its name suggests, the percentage of maximal heart rate method involves prescribing exercise at a certain percentage of maximum heart rate. To find out a person's true maximum heart rate we need to measure it in a laboratory. However, for most people this is impractical; therefore we can estimate maximum heart rate using the formula '220 - age'.

Example 1: Percentage Heart Rate Method

Case study: 'Mariella', age 30

Step 1. Calculate maximum heart rate (HR_{max})

$$\begin{aligned} \text{Estimated } HR_{max} &= 220 - \text{age} \\ &= 220 - 30 \end{aligned}$$

= **190 bpm** (beats per minute)

Step 2. Calculate exercise intensity

ACSM guidelines = 55–90% of HR_{max}

Lower target (55%) = $190 \times 55\%$

= 190×0.55

= **104.5 bpm** (we would round this up to 105 bpm)

Upper target (90%) = $190 \times 90\%$

= 190×0.90

= **171 bpm**

This formula gives us an idea of maximum heart rate, but we must remember that it is just an estimate and not completely accurate. Therefore using this method, according to ACSM guidelines, Mariella should exercise at a heart rate somewhere between **105 and 171 bpm**. This is quite a wide range so, depending on her fitness levels, you would need to decide whether to prescribe Mariella exercise to the upper or lower end of this scale.

Please note that there are online calculators available to calculate all of this information for you. Once such calculator can be found at:

http://www.sparkpeople.com/resource/calculator_target.asp

The HRR method is thought to be more accurate than the percentage of maximal heart rate method because it takes the individual's resting heart rate into account. The formula for calculating HRR can be seen in Box 2. The ACSM recommends that to improve aerobic fitness, exercise intensity should be set at either 40–85 per cent of (HRR) or 55–90 per cent of maximum heart rate (HR_{max}) (Pollock et al., 1998). These ranges are deliberately broad to reflect different levels of fitness; that is, someone with relatively low levels of fitness who has just started an exercise programme may need to work on the lower end of the scale, whereas someone who has a higher level of fitness, perhaps who has been exercising for a while, may need to work at an intensity towards the upper end of the scale. This demonstrates the importance of *progression* in an exercise programme.

Example 2: Heart Rate Reserve Method

Case study: 'Mariella', age 30

Step 1. Calculate maximum heart rate (HR_{max})

Estimated HR_{max} = $220 - \text{age}$

= $220 - 30$

= **190 bpm** (beats per minute)

Step 2. Measure resting heart rate (HR_{rest})

You would measure this either using a heart rate monitor or manually, using your fingers. Ideally it should be measured first thing in the morning. Let's imagine that Mariella's HR_{rest} has been measured

at **70 bpm**.

Step 3. Calculate heart rate reserve (HRR)

$$\begin{aligned} \text{HRR} &= \text{HR}_{\text{max}} - \text{HR}_{\text{rest}} \\ &= 190 - 70 \\ &= \mathbf{120 \text{ bpm}} \end{aligned}$$

Step 4. Calculate exercise intensity

$$\begin{aligned} \text{ACSM guidelines} &= 40-85\% \text{ HRR} \\ \text{Lower target (40\%)} &= (\text{HHR} \times 40\%) + \text{HR}_{\text{rest}} \\ &= (120 \times 0.40) + 70 \\ &= 48 + 70 \\ &= \mathbf{118 \text{ bpm}} \\ \text{Upper target (85\%)} &= (\text{HHR} \times 85\%) + \text{HR}_{\text{rest}} \\ &= (120 \times 0.85) + 70 \\ &= 102 + 70 \\ &= \mathbf{172 \text{ bpm}} \end{aligned}$$

Using this method, according to ACSM guidelines, Mariella should exercise somewhere between **118 and 172 bpm**.

Borg Scale

An alternative to using heart rate methods is the RPE method of measuring exercise intensity. However, you should note that it is difficult to give a general recommendation for RPE, as it is by its very nature open to personal interpretation; that is, what I consider to be a 12 may be different to what you consider to be a 12. RPE can be a useful way of measuring exercise intensity when heart rate monitoring is difficult or inappropriate. For example, some types of medication (e.g. beta blockers) given to people with hypertension lower the heart rate, and therefore heart rate measurement is not appropriate for people on this type of medication. The **Borg Rating of Perceived Exertion (RPE) Scale** is one way to measure perceived exertion. In medicine, this is used to document the patient's exertion during a test, and sports coaches use the scale to assess the intensity of training and competition. The original scale introduced by Gunnar Borg rated exertion on a scale of 6-20. The seemingly odd range of 6-20 is to follow the general heart rate of a healthy adult by multiplying by 10. For instance, a perceived exertion of 12 would be expected to coincide with a heart rate of roughly 120 beats per minute.

Set Points on Scale

It ranges from 6 to 20, where 6 means “no exertion at all” and 20 means “maximal exertion.” Choose the number from below that best describes your level of exertion. This will give you a good idea of the intensity level of your activity, and you can use this information to speed up or slow down your movements to reach your desired range.

Try to appraise your feeling of exertion as honestly as possible, without thinking about what the actual physical load is. Your own feeling of effort and exertion is important, not how it compares to other people's. Look at the scales and the expressions and then give a number.

- 6 No exertion at all
- 7 Extremely light (7.5)
- 8
- 9 Very light
- 10
- 11 Light
- 12
- 13 Somewhat hard
- 14
- 15 Hard
- 16
- 17 Very hard
- 18
- 19 Extremely hard
- 20 Maximal exertion

9 corresponds to “very light” exercise. For a healthy person, it is like walking slowly at his or her own pace for some minutes.

13 On the scale is “somewhat hard” exercise, but it still feels OK to continue.

17, Or “very hard,” is very strenuous. A healthy person can still go on, but he or she really has to push him- or herself. It feels very heavy, and the person is very tired.

19 on the scale is an extremely strenuous exercise level. For most people this is the most strenuous exercise they have ever experienced.

Taking Your Heart Rate

Generally, to determine whether you are exercising within the heart rate target zone, you must stop exercising briefly to take your pulse. You can take the pulse at the neck, the wrist, or the chest. We recommend the wrist. You can feel the radial pulse on the artery of the wrist in line with the thumb. Place the tips of the index and middle fingers over the artery and press lightly. Do not use the thumb. Take a full 60-second count of the heartbeats, or take for 30 seconds and multiply by 2. Start the count on a beat, which is counted as “zero.” If this number falls between 85 and 119 bpm in the case of the 50-year-old person, he or she is active within the target range for moderate-intensity activity.



Figure 1. Taking your heart rate

Section 11.4 Implementing Your Fitness Plan

The Beneficial Effects of Increasing Physical Activity: It's About Overload, Progression, and Specificity

Creating a safe and effective fitness program involves knowing certain basic principles of physical fitness: overload, progression, and specificity. **Overload** is the physical stress placed on the body when physical activity is greater in amount or intensity than usual. The body's structures and functions respond and adapt to these stresses. For example, aerobic physical activity places a stress on the cardiorespiratory system and muscles, requiring the lungs to move more air and the heart to pump more blood and deliver it to the working muscles. This increase in demand increases the efficiency and capacity of the lungs, heart, circulatory system, and exercising muscles. In the same way, muscle-strengthening and bone-strengthening activities overload muscles and bones, making them stronger.

Progression is closely tied to overload. Once a person reaches a certain fitness level, he or she progresses to higher levels of physical activity by continued overload and adaptation. Small, progressive changes in overload help the body adapt to the additional stresses while minimizing the risk of injury. **Specificity** means that the benefits of physical activity are specific to the body systems that are doing the work. For example, aerobic physical activity largely benefits the body's cardiovascular system. These principles should be taken into consideration during any exercise program if you expect to meet your goals.

Designing a program

Warm-up and Cool down Activities

Warm-up and cool-down activities are an important part of a person's physical activity plan. Commonly, the warm-up and cool-down involve doing an activity at a slower speed or lower intensity. A warm-up before moderate-or vigorous-intensity aerobic activity allows a gradual increase in heart rate and breathing at the start of the episode of activity. A cool-down after activity allows a gradual decrease at the end of the episode. Time spent doing

warm-up and cool-down may count toward meeting the aerobic activity Guidelines if the activity is at least moderate intensity (for example, walking briskly as a warm-up before jogging). A warm-up for muscle-strengthening activity commonly involves doing exercises with lighter weight.

Physical Activity in a Weight Control Plan

The health benefits of physical activity are generally independent of body weight. The good news for people needing to lose weight is that regular physical activity provides major health benefits, no matter how their weight changes over time.

Along with appropriate dietary intake, physical activity is an important part of maintaining healthy weight, losing weight, and keeping extra weight off once it has been lost. Physical activity also helps reduce abdominal fat and preserve muscle during weight loss. Adults should aim for a healthy, stable body weight. The amount of physical activity necessary to achieve this weight varies greatly from person to person.

The first step in achieving or maintaining a healthy weight is to meet the minimum level of physical activity in the Guidelines. For some people, this will result in a stable and healthy body weight, but for many it may not. People who are at a healthy body weight but slowly gaining weight can either gradually increase the level of physical activity (toward the equivalent of 300 minutes a week of moderate-intensity aerobic activity), or reduce caloric intake, or both, until their weight is stable. By regularly checking body weight, people can find the amount of physical activity that works for them.

Many adults will need to do more than the 150 minutes a week of moderate-intensity aerobic physical activity as part of a program to lose weight or keep it off. These adults should do more physical activity and/or further reduce their caloric intake. Some people will need to do the equivalent of 300 or more minutes of moderate-intensity physical activity a week to meet their weight-control goals. Combined with restricting caloric intake, these adults should gradually increase minutes or the intensity of aerobic physical activity per week, to the point at which the physical activity is effective in achieving a healthy weight.

Adults should strongly consider walking as one good way to get aerobic physical activity. Many studies show that walking has health benefits and a low risk of injury. It can be done year-round and in many settings. It is important to remember that all activities—both baseline and physical activity—“count” for energy balance. Active choices, such as taking the stairs rather than the elevator or adding short episodes of walking to the day, are examples of activities that can be helpful in weight control. For weight control, vigorous-intensity activity is far more time-efficient than moderate-intensity activity. For example, an adult who weighs 165 pounds (75 kg) will burn 560 calories from 150 minutes of brisk walking at 4 miles an hour (these calories are in addition to the calories normally burned by a body at rest). That person can burn the same number of additional calories in 50 minutes by running 5 miles at a 10 minutes-per-mile pace.

Achieving Your Physical Activities: The Possibilities are endless

These examples show how it's possible to meet the Guidelines by doing moderate-intensity or vigorous-intensity activity or a combination of both. Physical activity at this level provides substantial health benefits.

Ways to get the equivalent of 150 minutes (2 hours and 30 minutes) of moderate-intensity aerobic physical activity a week plus muscle-strengthening activities:

- Thirty minutes of brisk walking (moderate intensity) on 5 days, exercising with resistance bands (muscle strengthening) on 2 days;
- Twenty-five minutes of running (vigorous intensity) on 3 days, lifting weights on 2 days (muscle strengthening);
- Thirty minutes of brisk walking on 2 days, 60 minutes (1 hour) of social dancing (moderate intensity) on 1 evening, 30 minutes of mowing the lawn (moderate intensity) on 1 afternoon, heavy gardening (muscle strengthening) on 2 days;
- Thirty minutes of an aerobic dance class on 1 morning (vigorous intensity), 30 minutes of running on 1 day (vigorous intensity), 30 minutes of brisk walking on 1 day (moderate intensity), calisthenics (such as sit-ups, push-ups) on 3 days (muscle strengthening);
- Thirty minutes of biking to and from work on 3 days (moderate intensity), playing softball for 60 minutes on 1 day (moderate intensity), using weight machines on 2 days (muscle-strengthening on 2 days); and
- Forty-five minutes of doubles tennis on 2 days (moderate intensity), lifting weights after work on 1 day (muscle strengthening), hiking vigorously for 30 minutes and rock climbing (muscle strengthening) on 1 day.

Ways to be Even More Active

For adults who are already doing at least 150 minutes of moderate-intensity physical activity, here are a few ways to do even more. Physical activity at this level has even greater health benefits.

- Forty-five minutes of brisk walking every day, exercising with resistance bands on 2 or 3 days;
- Forty-five minutes of running on 3 or 4 days, circuit weight training in a gym on 2 or 3 days;
- Thirty minutes of running on 2 days, 45 minutes of brisk walking on 1 day, 45 minutes of an aerobics and weights class on 1 day, 90 minutes (1 hour and 30 minutes) of social dancing on 1 evening, 30 minutes of mowing the lawn, plus some heavy garden work on 1 day;
- Ninety minutes of playing soccer on 1 day, brisk walking for 15 minutes on 3 days, lifting weights on 2 days; and
- Forty-five minutes of stationary bicycling on 2 days, 60 minutes of basketball on 2 days, calisthenics on 3 days.

Be Safe and Active

Although physical activity has many health benefits, injuries and other adverse events do

sometimes happen. The most common injuries affect the musculoskeletal system (the bones, joints, muscles, ligaments, and tendons). Other adverse events can also occur during activity, such as overheating and dehydration. On rare occasions, people have heart attacks during activity.

The good news is that scientific evidence strongly shows that physical activity is safe for almost everyone. Moreover, the health benefits of physical activity far outweigh the risks. Still, people may hesitate to become physically active because of concern they'll get hurt. For these people, there is even more good news: They can take steps that are proven to reduce their risk of injury and adverse events.

The Guidelines in this module provide advice to help people do physical activity safely. Most advice applies to people of all ages. Specific guidance for particular age groups and people with certain conditions is also provided.

Physical Activity is Safe for Almost Everyone

Most people are not likely to be injured when doing moderate-intensity activities in amounts that meet the *Physical Activity Guidelines*. However, injuries and other adverse events do sometimes happen. The most common problems are musculoskeletal injuries. Even so, studies show that only one such injury occurs for every 1,000 hours of walking for exercise, and fewer than four injuries occur for every 1,000 hours of running. Both physical fitness and total amount of physical activity affect risk of musculoskeletal injuries. People who are physically fit have a lower risk of injury than people who are not. People who do more activity generally have a higher risk of injury than people who do less activity. To do physical activity safely and reduce risk of injuries and other adverse events, people should:

- Understand the risks and yet be confident that physical activity is safe for almost everyone.
- Choose to do types of physical activity that are appropriate for their current fitness level and health goals, because some activities are safer than others.
- Increase physical activity gradually over time whenever more activity is necessary to meet guidelines or health goals. Inactive people should "start low and go slow" by gradually increasing how often and how long activities are done.
- Protect themselves by using appropriate gear and sports equipment, looking for safe environments, following rules and policies, and making sensible choices about when, where, and how to be active.
- Be under the care of a health-care provider if they have chronic conditions or symptoms. People with chronic conditions and symptoms should consult their health-care provider about the types and amounts of activity appropriate for them.

Choose Appropriate Types and Amounts of Activity

People can reduce their risk of injury by choosing appropriate types of activity. The safest activities are moderate intensity and low impact, and don't involve purposeful collision or

contact. Walking for exercise, gardening or yard work, bicycling or exercise cycling, dancing, swimming, and golf are activities with the lowest injury rates. In the amounts commonly done by adults, walking (a moderate-intensity and low-impact activity) has a third or less of the injury risk of running (a vigorous-intensity and higher impact activity).

The risk of injury for a type of physical activity can also differ according to the purpose of the activity. For example, recreational bicycling or bicycling for transportation leads to fewer injuries than training for and competing in bicycle races. People who have had a past injury are at risk of injuring that body part again. The risk of injury can be reduced by performing appropriate amounts of activity and setting appropriate personal goals. Performing a variety of different physical activities may also reduce the risk of overuse injury. The risk of injury to bones, muscles, and joints is directly related to the gap between a person's usual level of activity and a new level of activity.

Increase Physical Activity Gradually Over Time

Scientific studies indicate that the risk of injury to bones, muscles, and joints is directly related to the gap between a person's usual level of activity and a new level of activity. The size of this gap is called the amount of overload. Creating a small overload and waiting for the body to adapt and recover reduces the risk of injury. When amounts of physical activity need to be increased to meet the Guidelines or personal goals, physical activity should be increased gradually over time, no matter what the person's current level of physical activity. Scientists have not established a standard for how to gradually increase physical activity over time. The following recommendations give general guidance for inactive people and those with low levels of physical activity on how to increase physical activity:

- Use relative intensity (intensity of the activity relative to a person's fitness) to guide the level of effort for aerobic activity.
- Generally, start with relatively moderate-intensity aerobic activity. Avoid relatively vigorous-intensity activity, such as shoveling snow or running. Adults with a low level of fitness may need to start with light activity, or a mix of light- to moderate-intensity activity.
- First, increase the number of minutes per session (duration), and the number of days per week (frequency) of moderate-intensity activity. Later, if desired, increase the intensity.
- Pay attention to the relative size of the increase in physical activity each week, as this is related to injury risk. For example, a 20-minute increase each week is safer for a person who does 200 minutes a week of walking (a 10 percent increase), than for a person who does 40 minutes a week (a 50 percent increase).

The available scientific evidence suggests that adding a small and comfortable amount of light- to moderate-intensity activity, such as 5 to 15 minutes of walking per session, 2 to 3 times a week, to one's usual activities has a low risk of musculoskeletal injury and no known risk of severe cardiac events. Because this range is rather wide, people should consider three factors in individualizing their rate of increase: age, level of fitness, and prior experience. The amount of time required to adapt to a new level of activity probably

depends on age. Youth and young adults probably can safely increase activity by small amounts every week or 2. Older adults appear to require more time to adapt to a new level of activity, in the range of 2 to 4 weeks.

Level of Fitness

Less fit adults are at higher risk of injury when doing a given amount of activity, compared to fitter adults. Slower rates of increase over time may reduce injury risk. This guidance applies to overweight and obese adults, as they are commonly less physically fit.

Prior Experience

People can use their experience to learn to increase physical activity over time in ways that minimize the risk of overuse injury. Generally, if an overuse injury occurred in the past with a certain rate of progression, a person should increase activity more slowly the next time.

Take Appropriate Precautions

Taking appropriate precautions means using the right gear and equipment, choosing safe environments in which to be active, following rules and policies, and making sensible choices about how, when, and where to be active.

Use Protective Gear and Appropriate Equipment

Using personal protective gear can reduce the frequency of injury. Personal protective gear is something worn by a person to protect a specific body part. Examples include helmets, eyewear and goggles, shin guards, elbow and knee pads, and mouth guards.

Using appropriate sports equipment can also reduce risk of injury. Sports equipment refers to sport or activity-specific tools, such as balls, bats, sticks, and shoes.

For the most benefit, protective equipment and gear should be:

- 14 The right equipment for the activity
- 15 Appropriately fitted
- 16 Appropriately maintained
- 17 Used consistently and correctly.

Be Active in Safe Environments

People can reduce their injury risks by paying attention to the places they choose to be active. To help themselves stay safe, people can look for:

- Physical separation from motor vehicles, such as sidewalks, walking paths, or bike lanes;
- Neighborhoods with traffic-calming measures that slow down traffic;
- Places to be active that are well-lighted, where other people are present, and that are well-maintained (no litter, broken windows);
- Shock-absorbing surfaces on playgrounds;
- Well-maintained playing fields and courts without holes or obstacles;
- Breakaway bases at baseball and softball fields; and
- Padded and anchored goals and goal posts at soccer and football fields.

Follow Rules and Policies That Promote Safety

Rules, policies, legislation, and laws are potentially the most effective and wide-reaching way to reduce activity-related injuries. To get the benefit, individuals should look for and follow these rules, policies, and laws. For example, policies that promote the use of bicycle helmets reduce the risk of head injury among cyclists. Rules against diving into shallow water at swimming pools prevent head and neck injuries.

Make Sensible Choices about How, When, and Where To Be Active

A person's choices can obviously influence the risk of adverse events. By making sensible choices, injuries and adverse events can be prevented. Consider weather conditions, such as extremes of heat and cold. For example, during very hot and humid weather, people lessen the chances of dehydration and heat stress by:

- Exercising in the cool of early morning as opposed to mid-day heat;
- Switching to indoor activities (playing basketball in the gym rather than on the playground);
- Changing the type of activity (swimming rather than playing soccer);
- Lowering the intensity of activity (walking rather than running); and
- Paying close attention to rest, shade, drinking enough fluids, and other ways to minimize effects of heat.

Inactive people who gradually progress over time to relatively moderate-intensity activity have no known risk of sudden cardiac events, and very low risk of bone, muscle, or joint injuries.

Exposure to air pollution is associated with several adverse health outcomes, including asthma attacks and abnormal heart rhythms. People who can modify the location or time of exercise may wish to reduce these risks by exercising away from heavy traffic and industrial sites, especially during rush hour or times when pollution is known to be high. However, current evidence indicates that the benefits of being active, even in polluted air, outweigh the risk of being inactive.

Advice from Health-Care Providers

The protective value of a medical consultation for persons with or without chronic diseases who are interested in increasing their physical activity level is not established. People without diagnosed chronic conditions (such as diabetes, heart disease, or osteoarthritis) and who do not have symptoms (such as chest pain or pressure, dizziness, or joint pain) do not need to consult a health-care provider about physical activity.

Inactive people who gradually progress over time to relatively moderate-intensity activity have no known risk of sudden cardiac events, and very low risk of bone, muscle, or joint injuries. A person who is habitually active with moderate-intensity activity can gradually increase to vigorous intensity without needing to consult a health-care provider. People who develop new symptoms when increasing their levels of activity should consult a

health-care provider.

Health-care providers can provide useful personalized advice on how to reduce risk of injuries. For people who wish to seek the advice of a health-care provider, it is particularly appropriate to do so when contemplating vigorous-intensity activity, because the risks of this activity are higher than the risks of moderate-intensity activity.

The choice of appropriate types and amounts of physical activity can be affected by chronic conditions. People with symptoms or known chronic conditions should be under the regular care of a health-care provider. In consultation with their provider, they can develop a physical activity plan that is appropriate for them. People with chronic conditions typically find that moderate-intensity activity is safe and beneficial. However, they may need to take special precautions. For example, people with diabetes need to pay special attention to blood sugar control and proper footwear during activity.

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CHAPTER 12: Cardiovascular Disease, Diabetes, and Cancer

Cardiovascular disease (CVD) is a class of diseases that involve the heart or blood vessels. Cardiovascular disease includes coronary artery diseases (CAD) such as angina and myocardial infarction (commonly known as a heart attack). Other CVDs include stroke, heart failure, hypertensive heart disease, rheumatic heart disease, cardiomyopathy, heart arrhythmia, congenital heart disease, valvular heart disease, carditis, aortic aneurysms, peripheral artery disease, thromboembolic disease, and venous thrombosis.

The underlying mechanisms vary depending on the disease. Coronary artery disease, stroke, and peripheral artery disease involve atherosclerosis, which is the narrowing of the inside of an artery due to the build up of plaque. This may be caused by high blood pressure, smoking, diabetes, lack of exercise, obesity, high blood cholesterol, poor diet, and excessive alcohol consumption, among others. High blood pressure results in 13% of CVD deaths, while tobacco results in 9%, diabetes 6%, lack of exercise 6% and obesity 5%. Rheumatic heart disease may follow untreated strep throat. It is estimated that 90% of CVD is preventable.

Coronary heart disease (CHD), also commonly referred to as just heart disease, is a common term for the buildup of plaque in the heart's arteries that could lead to heart attack. But is there a difference between coronary heart disease and coronary artery disease? The short answer is often no — health professionals frequently use the terms interchangeably. However, coronary heart disease, or CHD, is actually a result of coronary artery disease, or CAD. With coronary artery disease, plaque first grows within the walls of the coronary arteries until the blood flow to the heart's muscle is limited. View an illustration of coronary arteries below:

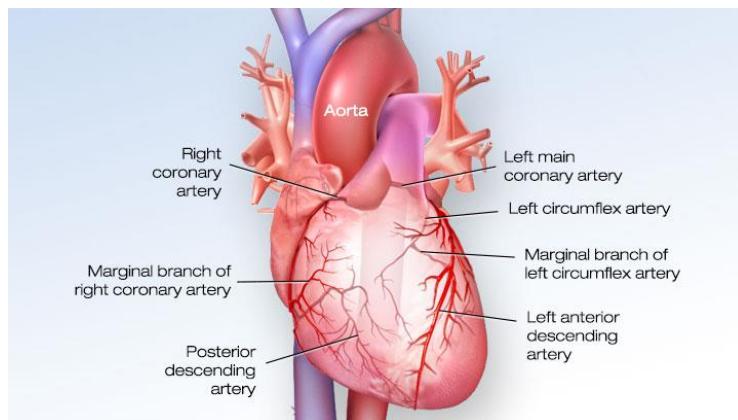


Figure 1. Coronary Arteries

The **Coronary Arteries** are the blood vessels that supply blood to your heart. They branch off of the aorta at its base. The right coronary artery, the left main coronary, the left anterior descending, and the left circumflex artery, are the four major coronary arteries. Blockage of these arteries is a

common cause of angina, heart disease, heart attacks and heart failure. This restriction of the blood supply to the tissues is also called ischemia. It may be chronic, narrowing of the coronary artery over time and limiting of the blood supply to part of the muscle. Or it can be acute, resulting from a sudden rupture of a plaque and formation of a thrombus or blood clot.

Anatomy of the Cardiovascular System

To fully understand Cardiovascular Diseases, it may be helpful to understand the anatomy of the cardiovascular system. It includes the following:

- **Heart:** the pump, divided into four chambers (R/L atria, R/L ventricles)
- **Arteries:** large vessels carrying oxygen-rich blood away from heart; have thick, muscular wall
- **Arterioles:** smaller arteries
- **Capillaries:** smallest vessels where gas exchange takes place, oxygen is delivered to tissues and carbon dioxide is carried away
- **Venuoles:** smallest veins, which carry carbon dioxide-rich blood, back to heart
- **Veins:** biggest vessels that carry carbon dioxide-rich blood back to heart; have one-way valves to prevent gravity from pulling blood backward (away from heart)
- **Atria:** the collecting chambers of the heart, located on top
- **Ventricles:** the pumping chambers of the heart, located on the bottom
- **Aorta:** the largest vessel (artery) in the body; all arteries branch from it

The right side of the heart (right atrium and right ventricle) takes CO₂-rich blood and sends it to the lungs for oxygenation. The left side of the heart (left atrium and ventricle) takes O₂-rich blood and delivers it to the body. The right side is said to be responsible for pulmonary circulation; the left side is said to be responsible for systemic circulation. Because of the distances involved, pulmonary circulation is a relatively low-pressure system, while systemic circulation is a relatively high-pressure system. In fact, when we measure blood pressure we're measuring systemic pressure.

Heart Disease and Stroke Facts

Heart Disease Facts

- Heart disease is the **leading cause** of death for both men and women.
- About **610,000 Americans** die from heart disease each year—that's **1 in every 4 deaths**.
- Coronary heart disease is the most common type of heart disease, killing about **365,000 people** in 2014.
- In the United States, someone has a heart attack **every 42 seconds**. Each minute, someone in the United States dies from a heart disease-related event.
- Heart disease is the **leading cause** of death for people of most racial/ethnic groups in the United States, including African Americans, Hispanics, and whites. For Asian Americans or Pacific Islanders and American Indians or Alaska Natives, heart disease is second only to cancer.
- Heart disease costs the United States about **\$207 billion** each year. This total includes the cost of health care services, medications, and lost productivity.

Risk Factors

High blood pressure, high LDL cholesterol, and smoking are key risk factors for heart disease. About **half of Americans** (49%) have at least one of these three risk factors. Several other medical conditions and lifestyle choices can also put people at a higher risk for heart disease, including:

- Diabetes
- Overweight and obesity
- Poor diet
- Physical inactivity
- Excessive alcohol use

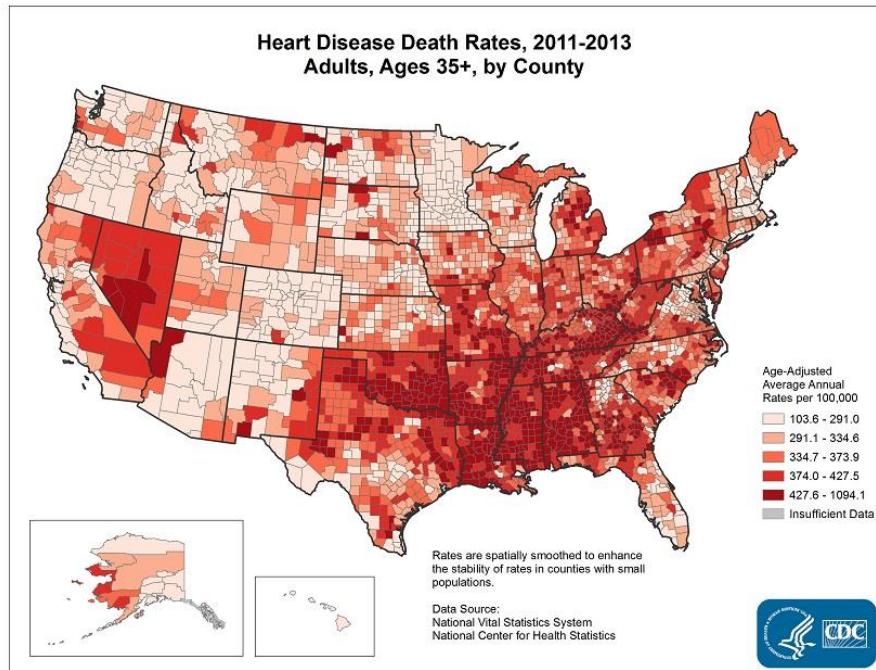


Figure 2. Heart Disease Death Rates

Stroke Facts

- 18 Stroke is the fifth leading cause of death in the United States, killing more than **130,000 Americans** each year—that's **1 of every 20 deaths**.
- 19 A stroke, sometimes called a brain attack, occurs when a clot blocks the blood supply to the brain or when a blood vessel in the brain bursts.
- 20 Someone in the United States has a stroke every **40 seconds**. Every **four minutes**, someone dies of stroke.
- 21 Every year, about **795,000 people** in the United States have a stroke. About 610,000 of these are first or new strokes; 185,000 are recurrent strokes.
- 22 Stroke is an important cause of disability. Stroke reduces mobility in more than half of stroke survivors age 65 and over.
- 23 Stroke costs the nation **\$33 billion** annually, including the cost of health care services, medications, and lost productivity.
- 24 You can't control some stroke risk factors, like heredity, age, gender, and ethnicity. Some medical conditions—including high blood pressure, high cholesterol, heart disease, diabetes, overweight or obesity, and previous stroke or transient ischemic

attack (TIA)—can also raise your stroke risk. Avoiding smoking and drinking too much alcohol, eating a balanced diet, and getting exercise are all choices you can make to reduce your risk.

Common Stroke Warning Signs and Symptoms

3. Sudden numbness or weakness of the face, arm, or leg—especially on one side of the body.
4. Sudden confusion, trouble speaking or understanding.
5. Sudden trouble seeing in one or both eyes.
6. Sudden trouble walking, dizziness, loss of balance or coordination.
7. Sudden severe headache with no known cause.

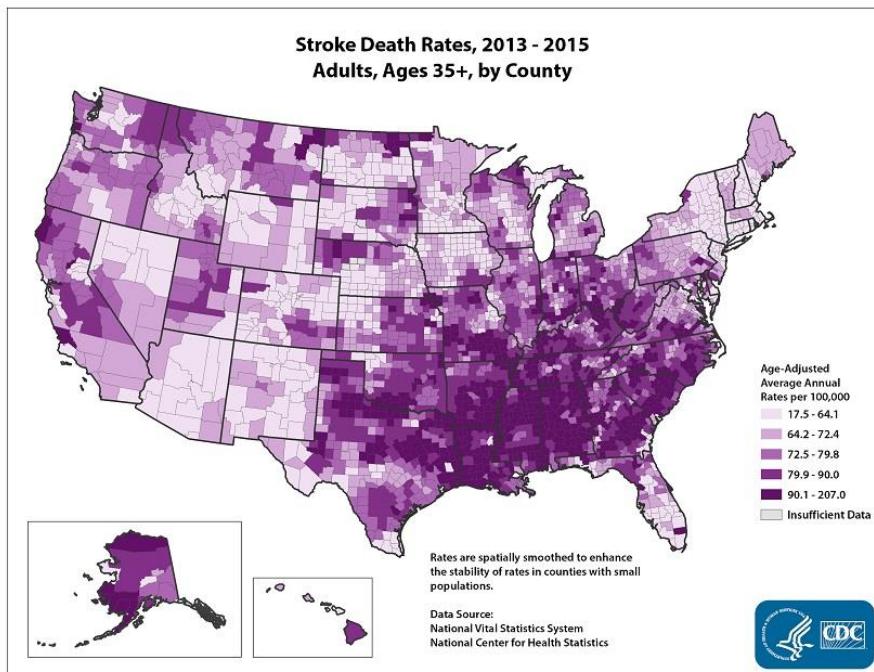


Figure 3. Stroke Death Rates

Coronary Artery Disease (CAD)

Coronary artery disease (CAD) is the most common type of heart disease in the United States. For some people, the first sign of CAD is a heart attack. Therefore, taking steps to reduce your risk for CAD is essential.

Research suggests that CAD (also referred to as coronary heart disease, abbreviated CHD) starts when certain factors damage the inner layers of the coronary arteries. These factors include:

- Smoking
- High levels of certain fats and cholesterol in the blood
- High blood pressure
- High levels of sugar in the blood due to insulin resistance or diabetes

Causes of CAD



Figure 4. Plaque Buildup

When damage occurs, your body starts a healing process. The healing may cause plaque to build up where the arteries are damaged. Plaque is made up of deposits of cholesterol and other substances in the artery. This progression of plaque build up is called **atherosclerosis**.

The buildup of plaque in the coronary arteries may start in childhood. Over time, plaque can narrow or block some of your coronary arteries. This reduces the flow of oxygen-rich blood to your heart muscle.

Eventually, an area of plaque can rupture (break open). If this happens, blood cell fragments called platelets will stick to the site of the injury and may clump together to form blood clots. Blood clots narrow the coronary arteries even more and worsen angina (chest discomfort or pain) or cause a heart attack.

Over time, CAD can weaken the heart muscle. This may lead to heart failure, a serious condition where the heart can't pump blood the way that it should. An irregular heartbeat, or arrhythmia, also can develop.

Other Conditions Related to Heart Disease

Coronary artery disease is the most common type of heart disease, but there are many other conditions that affect the heart:

- **Acute coronary syndrome** is a term that includes heart attack and unstable angina.
- **Angina**, a symptom of coronary artery disease, is chest pain or discomfort that occurs when the heart muscle is not getting enough blood. Angina may feel like pressure or a squeezing pain in the chest. The pain also may occur in the shoulders, arms, neck, jaw, or back. It may feel like indigestion. There are two forms of angina—stable or unstable:
 - **Stable angina** happens during physical activity or under mental or emotional stress.
 - **Unstable angina** is chest pain that occurs even while at rest, without apparent reason. This type of angina is a medical emergency.
- **Aortic aneurysm and dissection** are conditions that can affect the aorta, the major artery that carries blood from the heart to the body. An aneurysm is an enlargement in the aorta that can rupture or burst. A dissection is a tear in the aorta. Both of these conditions are medical emergencies.
- **Arrhythmias** are irregular or unusually fast or slow heartbeats. Arrhythmias can be serious. One example is called ventricular fibrillation. This type of arrhythmia causes an abnormal heart rhythm that leads to death unless treated right away with an electrical shock to the heart (called defibrillation). Other arrhythmias are less severe

but can develop into more serious conditions, such as atrial fibrillation, which can cause a stroke.

- **Atherosclerosis** occurs when plaque builds up in the arteries that supply blood to the heart (called coronary arteries). Plaque is made up of cholesterol deposits. Plaque buildup causes arteries to narrow over time.
- **Atrial fibrillation** is a type of arrhythmia that can cause rapid, irregular beating of the heart's upper chambers. Blood may pool and clot inside the heart, increasing the risk for heart attack and stroke.
- **Cardiomyopathy** occurs when the heart muscle becomes enlarged or stiff. This can lead to inadequate heart pumping (or weak heart pump) or other problems. Cardiomyopathy has many causes, including family history of the disease, prior heart attacks, uncontrolled high blood pressure, and viral or bacterial infections.
- **Congenital heart defects** are problems with the heart that are present at birth. They are the most common type of major birth defect. Examples include abnormal heart valves or holes in the heart's walls that divide the heart's chambers. Congenital heart defects range from minor to severe.
- **Heart failure** is often called congestive heart failure because of fluid buildup in the lungs, liver, gastrointestinal tract, and the arms and legs. Heart failure is a serious condition that occurs when the heart can't pump enough blood to meet the body's needs. It does not mean that the heart has stopped but that muscle is too weak to pump enough blood. The majority of heart failure cases are chronic, or long-term heart failures.
- The only cure for heart failure is a heart transplant. However, heart failure can be managed with medications or medical procedures.
- **Peripheral arterial disease (PAD)** occurs when the arteries that supply blood to the arms and legs (the periphery) become narrow or stiff. PAD usually results from atherosclerosis, the buildup of plaque and narrowing of the arteries. With this condition, blood flow and oxygen to the arm and leg muscles are low or even fully blocked. Signs and symptoms include leg pain, numbness, and swelling in the ankles and feet.
- **Rheumatic heart disease** is damage to the heart valves caused by a bacterial (streptococcal) infection called rheumatic fever.

Risk Factors for Coronary Heart Disease

Coronary heart disease risk factors are conditions or habits that raise your risk of coronary heart disease (CHD) and heart attack. These risk factors also increase the chance that existing CHD will worsen.

There are many known CHD risk factors. You can control some risk factors, but not others.

Risk factors you can control include:

- High blood cholesterol and triglyceride levels (a type of fat found in the blood)
- High blood pressure
- Diabetes and prediabetes
- Overweight and obesity
- Smoking
- Lack of physical activity

- Unhealthy diet
- Stress

The risk factors you can't control are age, gender, and family history of CHD.

Many people have at least one CHD risk factor. Your risk of CHD and heart attack increases with the number of risk factors you have and their severity. Also, some risk factors put you at greater risk of CHD and heart attack than others. Examples of these risk factors include smoking and diabetes. Many risk factors for coronary heart disease start during childhood. This is even more common now because many children are overweight and don't get enough physical activity. Researchers continue to study and learn more about CHD risk factors.

Section 12.1 Stroke

A stroke is a medical condition in which poor blood flow to the brain results in cell death. This results in part of the brain not functioning properly. The main types of stroke are:

- Ischemic stroke.
- Hemorrhagic stroke.
- Transient ischemic attack (a warning or “mini-stroke”).

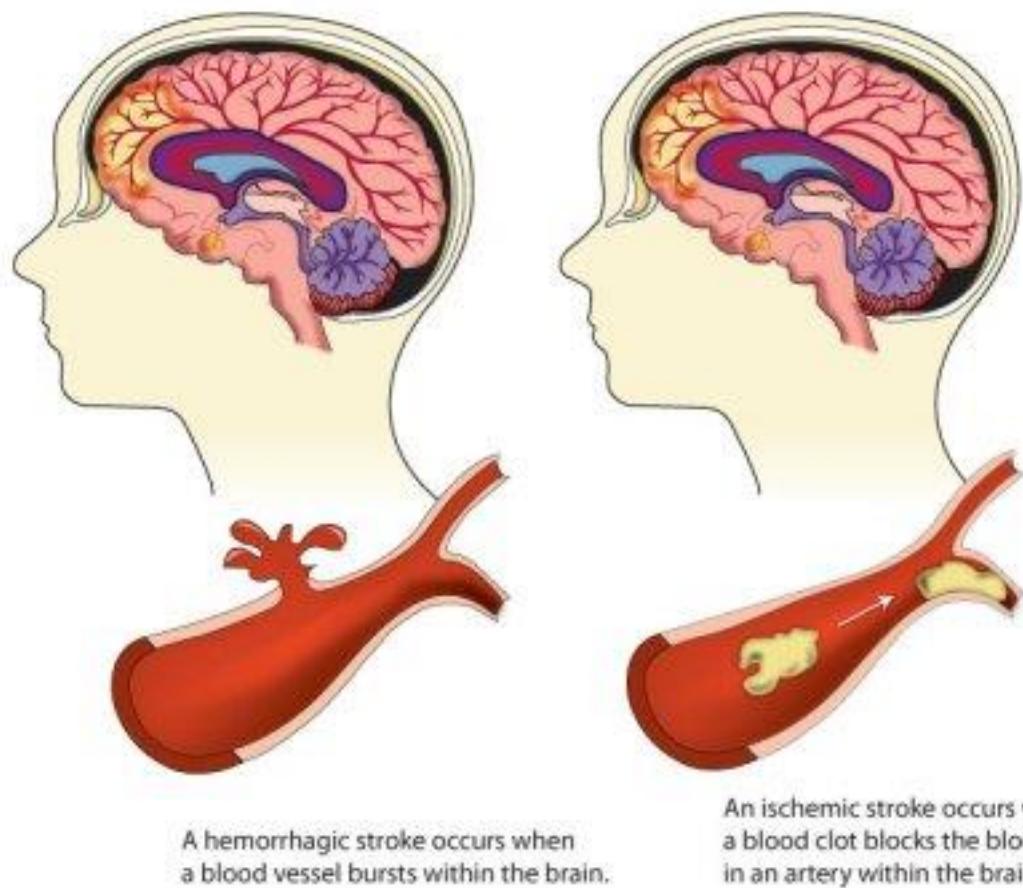


Figure 5. Hemorrhagic and Ischemic Strokes

Ischemic Stroke

Most strokes (85%) are ischemic strokes. If you have an ischemic stroke, the artery that supplies oxygen-rich blood to the brain becomes blocked.

Blood clots often cause the blockages that lead to ischemic strokes.

Hemorrhagic Stroke

A hemorrhagic stroke occurs when an artery in the brain leaks blood or ruptures (breaks open). The leaked blood puts too much pressure on brain cells, which damages them. High blood pressure and aneurysms—balloon-like bulges in an artery that can stretch and burst—are examples of conditions that can cause a hemorrhagic stroke.

There are two types of hemorrhagic strokes:

- **Intracerebral hemorrhage** is the most common type of hemorrhagic stroke. It occurs when an artery in the brain bursts, flooding the surrounding tissue with blood.
- **Subarachnoid hemorrhage** is a less common type of hemorrhagic stroke. It refers to bleeding in the area between the brain and the thin tissues that cover it.

Transient Ischemic Attack (TIA)

A transient ischemic attack (TIA) is sometimes called a “mini-stroke.” It is different from the major types of stroke because blood flow to the brain is blocked for only a short time—usually no more than 5 minutes.

It is important to know that:

- 25 A TIA is a warning sign of a future stroke.
- 26 A TIA is a medical emergency, just like a major stroke.
- 27 Strokes and TIAs require emergency care. **Call 9-1-1** right away if you feel signs of a stroke or see symptoms in someone around you.
- 28 There is no way to know in the beginning whether symptoms are from a TIA or from a major type of stroke.
- 29 Like ischemic strokes, blood clots often cause TIAs.
- 30 More than a third of people who have a TIA end up having a major stroke within 1 year if they don’t receive treatment, and 10%-15% will have a major stroke within 3 months of a TIA.

A health care team can usually find the cause and take steps to prevent a major stroke. Recognizing and treating TIAs can reduce the risk of a major stroke.

Recognizing a Stroke – Think FAST!

During a stroke, every minute counts! Fast treatment can lessen the brain damage that stroke can cause. By knowing the signs and symptoms of stroke, you can take quick action and perhaps save a life—maybe even your own.

Signs of Stroke in Men and Women

- Sudden **numbness** or weakness in the face, arm, or leg, especially on one side of the body
- Sudden **confusion**, trouble speaking, or difficulty understanding speech
- Sudden **trouble seeing** in one or both eyes
- Sudden **trouble walking**, dizziness, loss of balance, or lack of coordination
- Sudden **severe headache** with no known cause

Call 9-1-1 right away if you or someone else has any of these symptoms.

Acting F.A.S.T. can help stroke patients get the treatments they desperately need. The stroke treatments that work best are available only if the stroke is recognized and diagnosed within 3 hours of the first symptoms. Stroke patients may not be eligible for these if they don't arrive at the hospital in time.

If you think someone may be having a stroke, act F.A.S.T. and do the following simple test:

F—Face: Ask the person to smile. Does one side of the face droop?

A—Arms: Ask the person to raise both arms. Does one arm drift downward?

S—Speech: Ask the person to repeat a simple phrase. Is the speech slurred or strange?

T—Time: If you see any of these signs, call 9-1-1 right away.

Note the time when any symptoms first appear. This information helps health care providers determine the best treatment for each person. Do not drive to the hospital or let someone else drive you. Call an ambulance so that medical personnel can begin life-saving treatment on the way to the emergency room.

Section 12.2 Metabolic Syndrome

Metabolic syndrome is the name for a group of risk factors that raises your risk for heart disease and other health problems, such as diabetes and stroke.

The term “metabolic” refers to the biochemical processes involved in the body’s normal functioning. Risk factors are traits, conditions, or habits that increase your chance of developing a disease.

In this article, “heart disease” refers to coronary heart disease (CHD). CHD (also called coronary artery disease, abbreviated CAD) is a condition in which a waxy substance called plaque builds up inside the coronary (heart) arteries.

Plaque hardens and narrows the arteries, reducing blood flow to your heart muscle. This can lead to chest pain, a heart attack, heart damage, or even death.

Metabolic Risk Factors

The five conditions described below are metabolic risk factors. You can have any one of these risk factors by itself, but they tend to occur together. You must have at least three metabolic risk factors to be diagnosed with metabolic syndrome.

A Large Waistline

Having a large waistline means that you carry excess weight around your waist (abdominal obesity). This is also called having an “apple-shaped” figure. Your doctor will measure your waist to find out whether you have a large waistline.

A waist measurement of 35 inches or more for women or 40 inches or more for men is a metabolic risk factor. A large waistline means you’re at increased risk for heart disease and other health problems.

A High Triglyceride Level

Triglycerides are a type of fat found in the blood. **A triglyceride level of 150 mg/dL or higher** (or being on medicine to treat high triglycerides) is a metabolic risk factor. (The mg/dL is milligrams per deciliter—the units used to measure triglycerides, cholesterol, and blood sugar.)

A Low HDL Cholesterol Level

HDL cholesterol sometimes is called “good” cholesterol. This is because it helps remove cholesterol from your arteries.

An HDL cholesterol level of less than 50 mg/dL for women and less than 40 mg/dL for men (or being on medicine to treat low HDL cholesterol) is a metabolic risk factor.

High Blood Pressure

A blood pressure of 130/85 mmHg or higher (or being on medicine to treat high blood pressure) is a metabolic risk factor. (The mmHg is millimeters of mercury—the units used to measure blood pressure.)

If only one of your two blood pressure numbers is high, you’re still at risk for metabolic syndrome.

High Fasting Blood Sugar

A normal fasting blood sugar level is less than 100 mg/dL. A fasting blood sugar level between 100–125 mg/dL is considered prediabetes. A fasting blood sugar level of 126 mg/dL or higher is considered diabetes.

A fasting blood sugar level of 100 mg/dL or higher (or being on medicine to treat high blood sugar) is a metabolic risk factor.

About 85 percent of people who have type 2 diabetes—the most common type of diabetes—also have metabolic syndrome. These people have a much higher risk for heart

disease than the 15 percent of people who have type 2 diabetes without metabolic syndrome.

Cholesterol Management

What Is Cholesterol? To understand high blood cholesterol, it helps to learn about cholesterol. Cholesterol is a waxy, fat-like substance that's found in all cells of the body. Your body needs some cholesterol to make hormones, vitamin D, and substances that help you digest foods. Your body makes all the cholesterol it needs. However, cholesterol also is found in some of the foods you eat. Cholesterol travels through your bloodstream in small packages called lipoproteins. These packages are made of fat (lipid) on the inside and proteins on the outside.

Two kinds of lipoproteins carry cholesterol throughout your body: low-density lipoproteins (LDL) and high-density lipoproteins (HDL). Having healthy levels of both types of lipoproteins is important.

LDL cholesterol sometimes is called "bad" cholesterol. A high LDL level leads to a buildup of cholesterol in your arteries. (Arteries are blood vessels that carry blood from your heart to your body.)

HDL cholesterol sometimes is called "good" cholesterol. This is because it carries cholesterol from other parts of your body back to your liver. Your liver removes the cholesterol from your body.

What Is High Blood Cholesterol?

High blood cholesterol is a condition in which you have too much cholesterol in your blood. By itself, the condition usually has no signs or symptoms. Thus, many people don't know that their cholesterol levels are too high.

People who have high blood cholesterol have a greater chance of getting coronary heart disease, also called coronary artery disease. (In this article, the term "heart disease" refers to coronary heart disease.) The higher the level of LDL cholesterol in your blood, the GREATER your chance is of getting heart disease. The higher the level of HDL cholesterol in your blood, the LOWER your chance is of getting heart disease.

Coronary heart disease is a condition in which plaque builds up inside the coronary (heart) arteries. Plaque is made up of cholesterol, fat, calcium, and other substances found in the blood. When plaque builds up in the arteries, the condition is called atherosclerosis.

What Causes High Blood Cholesterol?

Many factors can affect the cholesterol levels in your blood. You can control some factors, but not others.

Factors You Can Control

Diet

Cholesterol is found in foods that come from animal sources, such as egg yolks, meat, and cheese. Some foods have fats that raise your cholesterol level.

For example, **saturated fat raises your low-density lipoprotein (LDL) cholesterol level more than anything else in your diet**. Saturated fat is found in some meats, dairy products, chocolate, baked goods, and deep-fried and processed foods.

Trans fatty acids (*trans* fats) raise your LDL cholesterol and lower your high-density lipoprotein (HDL) cholesterol. *Trans* fats are made when hydrogen is added to vegetable oil to harden it. *Trans* fats are found in some fried and processed foods.

Limiting foods with cholesterol, saturated fat, and *trans* fats can help you control your cholesterol levels.

Physical Activity and Weight

Lack of physical activity can lead to weight gain. Being overweight tends to raise your LDL level, lower your HDL level, and increase your total cholesterol level. (Total cholesterol is a measure of the total amount of cholesterol in your blood, including LDL and HDL.) Routine physical activity can help you lose weight and lower your LDL cholesterol. Being physically active also can help you raise your HDL cholesterol level.

Factors You Can't Control

Heredity

High blood cholesterol can run in families. An inherited condition called familial hypercholesterolemia causes very high LDL cholesterol. (“Inherited” means the condition is passed from parents to children through genes.) This condition begins at birth, and it may cause a heart attack at an early age.

Age and Sex

Starting at puberty, men often have lower levels of HDL cholesterol than women. As women and men age, their LDL cholesterol levels often rise. Before age 55, women usually have lower LDL cholesterol levels than men. However, after age 55, women can have higher LDL levels than men.

How Is High Blood Cholesterol Diagnosed?

Your doctor will diagnose high blood cholesterol by checking the cholesterol levels in your blood. A blood test called a lipoprotein panel can measure your cholesterol levels. Before the test, you'll need to fast (not eat or drink anything but water) for 9 to 12 hours.

The lipoprotein panel will give your doctor information about your:

- Total cholesterol. Total cholesterol is a measure of the total amount of cholesterol in your blood, including low-density lipoprotein (LDL) cholesterol and high-density lipoprotein (HDL) cholesterol.
- LDL cholesterol. LDL, or “bad,” cholesterol is the main source of cholesterol buildup and blockages in the arteries.
- HDL cholesterol. HDL, or “good,” cholesterol helps remove cholesterol from your arteries.
- Triglycerides (tri-GLIH-seh-rides). Triglycerides are a type of fat found in your blood. Some studies suggest that a high level of triglycerides in the blood may raise the risk of coronary heart disease, especially in women.

If it's not possible to have a lipoprotein panel, knowing your total cholesterol and HDL cholesterol can give you a general idea about your cholesterol levels.

Testing for total and HDL cholesterol does not require fasting. If your total cholesterol is 200 mg/dL or more, or if your HDL cholesterol is less than 40 mg/dL, your doctor will likely recommend that you have a lipoprotein panel. (Cholesterol is measured as milligrams (mg) of cholesterol per deciliter (dL) of blood.)

The tables below show total, LDL, and HDL cholesterol levels and their corresponding categories. See how your cholesterol numbers compare to the numbers in the tables below.

Table 1. Cholesterol Levels

Total Cholesterol Level	Total Cholesterol Category
Less than 200 mg/dL	Desirable
200–239 mg/dL	Borderline high
240 mg/dL and higher	High
LDL Cholesterol Level	LDL Cholesterol Category
Less than 100 mg/dL	Optimal
100–129 mg/dL	Near optimal/above optimal
130–159 mg/dL	Borderline high

HDL Cholesterol Level	HDL Cholesterol Category
160–189 mg/dL	High
190 mg/dL and higher	Very high
Less than 40 mg/dL	A major risk factor for heart disease
40–59 mg/dL	The higher, the better
60 mg/dL and higher	Considered protective against heart disease

Triglycerides also can raise your risk for heart disease. If your triglyceride level is borderline high (150–199 mg/dL) or high (200 mg/dL or higher), you may need treatment.

How Is High Blood Cholesterol Treated?

High blood cholesterol is treated with lifestyle changes and medicines. The main goal of treatment is to lower your low-density lipoprotein (LDL) cholesterol level enough to reduce your risk for coronary heart disease, heart attack, and other related health problems.

Your risk for heart disease and heart attack goes up as your LDL cholesterol level rises and your number of heart disease risk factors increases.

Some people are at high risk for heart attacks because they already have heart disease. Other people are at high risk for heart disease because they have diabetes or more than one heart disease risk factor.

Talk with your doctor about lowering your cholesterol and your risk for heart disease. Also, check the list to find out whether you have risk factors that affect your LDL cholesterol goal:

- Cigarette smoking
- High blood pressure (140/90 mmHg or higher), or you're on medicine to treat high blood pressure
- Low high-density lipoprotein (HDL) cholesterol (less than 40 mg/dL)
- Family history of early heart disease (heart disease in father or brother before age 55; heart disease in mother or sister before age 65)
- Age (men 45 years or older; women 55 years or older)

Lowering Cholesterol Using Therapeutic Lifestyle Changes (TLC)

TLC is a set of lifestyle changes that can help you lower your LDL cholesterol. The main parts of the TLC program are a healthy diet, weight management, and physical activity.

The TLC Diet

With the TLC diet, less than 7 percent of your daily calories should come from saturated fat. This kind of fat is found in some meats, dairy products, chocolate, baked goods, and deep-fried and processed foods.

No more than 25 to 35 percent of your daily calories should come from all fats, including saturated, *trans*, monounsaturated, and polyunsaturated fats.

You also should have less than 200 mg a day of cholesterol. The amounts of cholesterol and the types of fat in prepared foods can be found on the foods' Nutrition Facts labels.

Foods high in soluble fiber also are part of the TLC diet. They help prevent the digestive tract from absorbing cholesterol. These foods include:

- Whole-grain cereals such as oatmeal and oat bran
- Fruits such as apples, bananas, oranges, pears, and prunes
- Legumes such as kidney beans, lentils, chick peas, black-eyed peas, and lima beans

A diet rich in fruits and vegetables can increase important cholesterol-lowering compounds in your diet. These compounds, called plant stanols or sterols, work like soluble fiber.

A healthy diet also includes some types of fish, such as salmon, tuna (canned or fresh), and mackerel. These fish are a good source of omega-3 fatty acids. These acids may help protect the heart from blood clots and inflammation and reduce the risk of heart attack. Try to have about two fish meals every week.

You also should try to limit the amount of sodium (salt) that you eat. This means choosing low-salt and "no added salt" foods and seasonings at the table or while cooking. The Nutrition Facts label on food packaging shows the amount of sodium in the item.

Try to limit drinks with alcohol. Too much alcohol will raise your blood pressure and triglyceride level. (Triglycerides are a type of fat found in the blood.) Alcohol also adds extra calories, which will cause weight gain.

Men should have no more than two drinks containing alcohol a day. Women should have no more than one drink containing alcohol a day. One drink is a glass of wine, beer, or a small amount of hard liquor.

Weight Management

If you're overweight or obese, losing weight can help lower LDL cholesterol. Maintaining a healthy weight is especially important if you have a condition called metabolic syndrome.

Metabolic syndrome is the name for a group of risk factors that raise your risk for heart disease and other health problems, such as diabetes and stroke.

The five metabolic risk factors are a large waistline (abdominal obesity), a high triglyceride level, a low HDL cholesterol level, high blood pressure, and high blood sugar. Metabolic syndrome is diagnosed if you have at least three of these metabolic risk factors.

Physical Activity

Routine physical activity can lower LDL cholesterol and triglycerides and raise your HDL cholesterol level.

People gain health benefits from as little as 60 minutes of moderate-intensity aerobic activity per week (however, 150 minutes per week is the recommendation). The more active you are, the more you will benefit.

Cholesterol-Lowering Medicines

In addition to lifestyle changes, your doctor may prescribe medicines to help lower your cholesterol. Even with medicines, you should continue the TLC program.

Medicines can help control high blood cholesterol, but they don't cure it.

List of Treatments for Cardiovascular Disease

- Drugs: There are a number of drugs on the market that aid in the prevention and management of all of the aforementioned conditions. They cannot replace the benefits of diet, exercise, and stress management, but should be used in conjunction.
- Angiogram: One of many diagnostic tests used to determine location and extent of coronary artery disease.
- Angioplasty: A procedure where a balloon is fed through a catheter into a coronary artery and a blockage is opened when the balloon is inflated.
- Stent: A “prop” that keeps the artery open following angioplasty.
- Coronary Artery Bypass Graft: A surgical procedure in which blockages in coronary arteries are bypassed via grafting of vessels (vein & arterial tissues can be used) around the blockage. This used to be done only “open chest” or “open heart”; modern surgical practice allows for some blockages to be bypassed via small opening in between the ribs (rather than sawing open the breast bone).
- Endarterectomy: When the carotid artery (feeds the brain) is opened via a procedure (angioplasty &/or stent, usually).
- Valve replacements: valves separate the chambers of the heart. Sometimes those valves become compromised either mechanically or via infection and have to be replaced. Porcine or mechanical valves can be used.

- Heart transplant: When a heart has been damaged beyond repair a patient may become a candidate for a transplant; a large percentage of patients awaiting transplants never receive one.

Section 12.3 Diabetes

Diabetes is a disease that occurs when your blood glucose, also called blood sugar, is too high. Blood glucose is your main source of energy and comes from the food you eat. Insulin, a hormone made by the pancreas, helps glucose from food get into your cells to be used for energy. Sometimes your body doesn't make enough—or any—insulin or doesn't use insulin well. Glucose then stays in your blood and doesn't reach your cells. Over time, having too much glucose in your blood can cause health problems. The most common types of diabetes are type 1, type 2, and gestational diabetes.

Type 1 diabetes

If you have type 1 diabetes, your body does not make insulin. Your immune system attacks and destroys the cells in your pancreas that make insulin. Type 1 diabetes is usually diagnosed in children and young adults, although it can appear at any age. People with type 1 diabetes need to take insulin every day to stay alive.

Type 2 diabetes

If you have type 2 diabetes, your body does not make or use insulin well. You can develop type 2 diabetes at any age, even during childhood. However, this type of diabetes occurs most often in middle-aged and older people. Type 2 is the most common type of diabetes.

Gestational diabetes

Gestational diabetes develops in some women when they are pregnant. Most of the time, this type of diabetes goes away after the baby is born. However, if you've had gestational diabetes, you have a greater chance of developing type 2 diabetes later in life. Sometimes diabetes diagnosed during pregnancy is actually type 2 diabetes.

Other types of diabetes

Less common types include monogenic diabetes, which is an inherited form of diabetes, and cystic fibrosis-related diabetes .

How common is diabetes?

As of 2015, 30.3 million people in the United States, or 9.4 percent of the population, had diabetes. More than 1 in 4 of them didn't know they had the disease. Diabetes affects 1 in 4 people over the age of 65. About 90-95 percent of cases in adults are type 2 diabetes.¹

Risk Factors for Type 2 Diabetes

Developing type 2 diabetes depends on a combination of risk factors such as genes and lifestyle. Although some risk factors are non-modifiable such as family history, age, or ethnicity, lifestyle risk factors around eating, physical activity, and weight are modifiable. These lifestyle changes can affect ones chances of developing type 2 diabetes. Read about risk factors for type 2 diabetes below and see which ones apply to you. You are more likely to develop type 2 diabetes if you

- are overweight or obese
- are age 45 or older
- have a family history of diabetes
- are African American, Alaska Native, American Indian, Asian American, Hispanic/Latino, Native Hawaiian, or Pacific Islander
- have high blood pressure
- have a low level of HDL ("good") cholesterol, or a high level of triglycerides
- have a history of gestational diabetes or gave birth to a baby weighing 9 pounds or more
- are not physically active
- have a history of heart disease or stroke
- have depression
- have polycystic ovary syndrome , also called PCOS
- have acanthosis nigricans—dark, thick, and velvety skin around your neck or armpits

You can also take the Diabetes Risk Test to learn about your risk for type 2 diabetes.

What health problems can people with diabetes develop?

Over time, high blood glucose leads to problems such as

- heart disease
- stroke
- kidney disease
- eye problems
- dental disease
- nerve damage
- foot problems

Symptoms & Causes of Diabetes

Symptoms of diabetes include

- increased thirst and urination
- increased hunger
- fatigue

- blurred vision
- numbness or tingling in the feet or hands
- sores that do not heal
- unexplained weight loss

Symptoms of type 1 diabetes can start quickly, in a matter of weeks. Symptoms of type 2 diabetes often develop slowly—over the course of several years—and can be so mild that you might not even notice them. Many people with type 2 diabetes have no symptoms. Some people do not find out they have the disease until they have diabetes-related health problems, such as blurred vision or heart trouble.

What causes type 1 diabetes?

Type 1 diabetes occurs when your immune system, the body's system for fighting infection, attacks and destroys the insulin-producing beta cells of the pancreas. Scientists think type 1 diabetes is caused by genes and environmental factors, such as viruses, that might trigger the disease. Studies such as TrialNet are working to pinpoint causes of type 1 diabetes and possible ways to prevent or slow the disease.

What causes type 2 diabetes?

Type 2 diabetes—the most common form of diabetes—is caused by several factors, including lifestyle factors and genes.

Overweight, obesity, and physical inactivity

You are more likely to develop type 2 diabetes if you are not physically active and are overweight or obese. Extra weight sometimes causes insulin resistance and is common in people with type 2 diabetes. The location of body fat also makes a difference. Extra belly fat is linked to insulin resistance, type 2 diabetes, and heart and blood vessel disease.

Insulin resistance

Type 2 diabetes usually begins with insulin resistance, a condition in which muscle, liver, and fat cells do not use insulin well. As a result, your body needs more insulin to help glucose enter cells. At first, the pancreas makes more insulin to keep up with the added demand. Over time, the pancreas can't make enough insulin, and blood glucose levels rise.

Genes and family history

As in type 1 diabetes, certain genes may make you more likely to develop type 2 diabetes. The disease tends to run in families and occurs more often in these racial/ethnic groups:

- African Americans
- Alaska Natives
- American Indians

- Asian Americans
- Hispanics/Latinos
- Native Hawaiians
- Pacific Islanders

Genes also can increase the risk of type 2 diabetes by increasing a person's tendency to become overweight or obese.

What causes gestational diabetes?

Scientists believe gestational diabetes, a type of diabetes that develops during pregnancy, is caused by the hormonal changes of pregnancy along with genetic and lifestyle factors.

Insulin resistance

Hormones produced by the placenta contribute to insulin resistance, which occurs in all women during late pregnancy. Most pregnant women can produce enough insulin to overcome insulin resistance, but some cannot. Gestational diabetes occurs when the pancreas can't make enough insulin.

As with type 2 diabetes, extra weight is linked to gestational diabetes. Women who are overweight or obese may already have insulin resistance when they become pregnant. Gaining too much weight during pregnancy may also be a factor.



Figure 6. Pregnancy can sometimes contribute to diabetic complications

Hormonal changes, extra weight, and family history can contribute to gestational diabetes.

Genes and family history

Having a family history of diabetes makes it more likely that a woman will develop gestational diabetes, which suggests that genes play a role. Genes may also explain why the disorder occurs more often in African Americans, American Indians, Asians, and Hispanics/Latinas.

What else can cause diabetes?

Genetic mutations , other diseases, damage to the pancreas, and certain medicines may also cause diabetes.

Diagnosing diabetes and prediabetes?

Health care professionals most often use the fasting plasma glucose (FPG) test or the A1C test to diagnose diabetes. In some cases, they may use a random plasma glucose (RPG) test. The FPG blood test measures your blood glucose level at a single point in time. For the most reliable results, it is best to have this test in the morning, after you fast for at least 8 hours. Fasting means having nothing to eat or drink except sips of water.

The A1C test is a blood test that provides your average levels of blood glucose over the past 3 months. Other names for the A1C test are hemoglobin A1C, HbA1C, glycated hemoglobin, and glycosylated hemoglobin test. You can eat and drink before this test. When it comes to using the A1C to diagnose diabetes, your doctor will consider factors such as your age and whether you have anemia or another problem with your blood.¹ The A1C test is not accurate in people with anemia.

How can I lower my chances of developing type 2 diabetes?

Research such as the Diabetes Prevention Program shows that you can do a lot to reduce your chances of developing type 2 diabetes. Here are some things you can change to lower your risk:

- **Lose weight and keep it off.** You may be able to prevent or delay diabetes by losing 5 to 7 percent of your starting weight.¹ For instance, if you weigh 200 pounds, your goal would be to lose about 10 to 14 pounds.
- **Move more.** Get at least 30 minutes of physical activity 5 days a week. If you have not been active, talk with your health care professional about which activities are best. Start slowly to build up to your goal.
- **Eat healthy foods most of the time.** Eat smaller portions to reduce the amount of calories you eat each day and help you lose weight. Choosing foods with less fat is another way to reduce calories. Drink water instead of sweetened beverages.

Manage Diabetes

Although diabetes has no cure, it can be managed by taking the right steps to stay healthy. The National Institute of Health recommends make the following recommendations for managing diabetes:

- **Follow a diabetes meal plan:** Choose fruits and vegetables, beans, whole grains, chicken or turkey without the skin, fish, lean meats, and nonfat or low-fat milk and cheese. Drink water instead of sugar-sweetened beverages. Choose foods that are lower in calories, saturated fat, trans fat, sugar, and salt. Learn more about eating, diet, and nutrition with diabetes.
- **Engage in physical activity daily:** Set a goal to be more physically active. Try to work up to 30 minutes or more of physical activity on most days of the week. Brisk walking and swimming are good ways to move more.
- **Take appropriate medicine:** Take medicine(s) for diabetes and any other health problems, even when feeling good or having reached a healthy blood glucose, blood pressure, and cholesterol goals.
- **Check your blood glucose levels:** For many people with diabetes, checking their blood glucose level each day is an important way to manage their diabetes. Monitoring blood glucose levels is most important for anyone taking insulin. The results of blood glucose monitoring can help diabetes sufferers make decisions about food, physical activity, and medicines.



Figure 7. Measuring Blood Glucose Levels is an important part of managing diabetes. The most common way to check a blood glucose level at home is with a blood glucose meter. You get a drop of blood by pricking the side of your fingertip with a lancet. Then you apply the blood to a test strip. The meter will show you how much glucose is in your blood at the moment.

Section 12.4 Cancer

What Is Cancer?

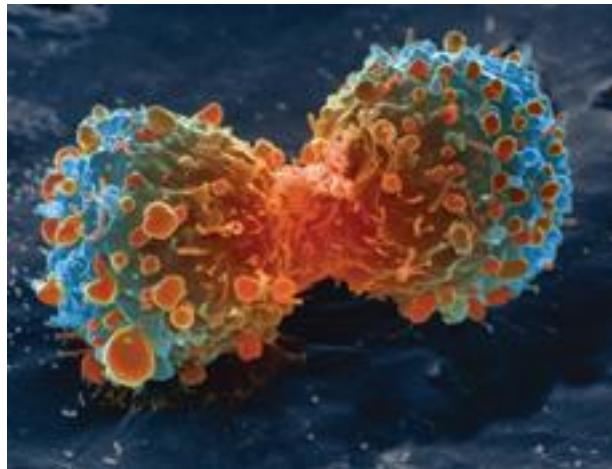


Figure 8. Cancerous Cells

Cancer is the name given to a collection of related diseases. In all types of cancer, some of the body's cells begin to divide without stopping and spread into surrounding tissues.

Cancer can start almost anywhere in the human body, which is made up of trillions of cells. Normally, human cells grow and divide to form new cells as the body needs them. When cells grow old or become damaged, they die, and new cells take their place.

When cancer develops, however, this orderly process breaks down. As cells become more and more abnormal, old or damaged cells survive when they should die, and new cells form when they are not needed. These extra cells can divide without stopping and may form growths called tumors.

Cancerous tumors are malignant, which means they can spread into, or invade, nearby tissues. In addition, as these tumors grow, some cancer cells can break off and travel to distant places in the body through the blood or the lymph system and form new tumors far from the original tumor.

Unlike malignant tumors, benign tumors do not spread into, or invade, nearby tissues. Benign tumors can sometimes be quite large, however. When removed, they usually don't grow back, whereas malignant tumors sometimes do. Unlike most benign tumors elsewhere in the body, benign brain tumors can be life threatening.

Key Cancer Terms

- **Neoplasms:** clusters of abnormal cells; aka "tumors." When the neoplasms or tumors grow out and replace normal cells they are said to be "*infiltrating*" or "*metastasizing*" which means traveling to other parts of the body via the blood or lymph.
- **Carcinoma:** most common form; starts in the epithelium.
- **Sarcoma:** forms in connective tissue: bones, muscles, blood vessels.

- **Leukemias:** form in blood-forming tissues: bone marrow, lymph nodes, and the spleen.
- **Lymphomas:** form in the cells of the lymph system (the system that filters out impurities and/or infection).
- Conceptually, cancer is thought to develop via the turning on of genes called “**oncogenes**” or genes that have gone awry. The DNA in these cells replicates at an accelerated rate. “Tumor suppressor genes”, which are present in all of us, fail to stop these cells from dividing thereby allowing a tumor to form.
- A “**malignant**” tumor is a cancerous tumor, whereas a “**benign**” tumor is not cancerous and of no imminent danger to the body.

How Cancer Arises

Cancer is caused by changes to genes that control the way our cells function, especially how they grow and divide.

Genetic changes that cause cancer can be inherited from our parents. They can also arise during a person’s lifetime as a result of errors that occur as cells divide or because of damage to DNA caused by certain environmental exposures. Cancer-causing environmental exposures include substances, such as the chemicals in tobacco smoke, and radiation, such as ultraviolet rays from the sun.

When Cancer Spreads

In metastasis, cancer cells break away from where they first formed (primary cancer), travel through the blood or lymph system, and form new tumors (metastatic tumors) in other parts of the body. The metastatic tumor is the same type of cancer as the primary tumor.

A cancer that has spread from the place where it first started to another place in the body is called metastatic cancer. **The process by which cancer cells spread to other parts of the body is called metastasis.**

Metastatic cancer has the same name and the same type of cancer cells as the original, or primary, cancer. For example, breast cancer that spreads to and forms a metastatic tumor in the lung is metastatic breast cancer, not lung cancer.

Under a microscope, metastatic cancer cells generally look the same as cells of the original cancer. Moreover, metastatic cancer cells and cells of the original cancer usually have some molecular features in common, such as the presence of specific chromosome changes.

Cancer Stages

Cancers are staged 1-3/4, depending on the cancer and the severity. When detected at stage 1, a person suffering from most types of cancer has about a 95% of surviving. The

odds go down as you get to stage 3 or 4 (some cancers only have 3 stages, others 4). Doctors will often add an 'A' or 'B' to the staging as well, and this can relate to whether or not the cancer has invaded other tissues.

Tissue Changes That Are Not Cancer

Not every change in the body's tissues is cancer. Some tissue changes may develop into cancer if they are not treated, however. Here are some examples of tissue changes that are not cancer but, in some cases, are monitored:

Hyperplasia occurs when cells within a tissue divide faster than normal and extra cells build up, or proliferate. However, the cells and the way the tissue is organized look normal under a microscope. Hyperplasia can be caused by several factors or conditions, including chronic irritation.

Dysplasia is a more serious condition than hyperplasia. In dysplasia, there is also a buildup of extra cells. But the cells look abnormal and there are changes in how the tissue is organized. In general, the more abnormal the cells and tissue look, the greater the chance that cancer will form.

Some types of dysplasia may need to be monitored or treated. An example of dysplasia is an abnormal mole (called a dysplastic nevus) that forms on the skin. A dysplastic nevus can turn into melanoma, although most do not.

Normal cells may become cancer cells. Before cancer cells form in tissues of the body, the cells go through abnormal changes called hyperplasia and dysplasia. In hyperplasia, there is an increase in the number of cells in an organ or tissue that appear normal under a microscope. In dysplasia, the cells look abnormal under a microscope but are not cancer. Hyperplasia and dysplasia may or may not become cancer.

Types of Cancer

There are more than 100 types of cancer. Types of cancer are usually named for the organs or tissues where the cancers form. For example, lung cancer starts in cells of the lung, and brain cancer starts in cells of the brain. Cancers also may be described by the type of cell that formed them, such as an epithelial cell or a squamous cell.

Common Cancer Types

This list of common cancer types includes cancers that are diagnosed with the greatest frequency in the United States, excluding non-melanoma skin cancers:

- **Bladder Cancer:** The most common type of bladder cancer is transitional cell carcinoma, also called urothelial carcinoma. Smoking is a major risk factor for bladder cancer. Bladder cancer is often diagnosed at an early stage.

- **Breast Cancer:** Breast cancer is the second most common cancer in women after skin cancer. Mammograms can detect breast cancer early, possibly before it has spread.
- **Colon and Rectal Cancer:** Colorectal cancer often begins as a growth called a polyp inside the colon or rectum. Finding and removing polyps can prevent colorectal cancer.
- **Endometrial Cancer:** Uterine cancers can be of two types: endometrial cancer (common) and uterine sarcoma (rare). Endometrial cancer can often be cured. Uterine sarcoma is often more aggressive and harder to treat.
- **Kidney Cancer:** Kidney cancer can develop in adults and children. The main types of kidney cancer are renal cell cancer, transitional cell cancer, and Wilms tumor. Certain inherited conditions increase the risk of kidney cancer.
- **Leukemia:** Leukemia is a broad term for cancers of the blood cells. The type of leukemia depends on the type of blood cell that becomes cancer and whether it grows quickly or slowly. Leukemia occurs most often in adults older than 55, but it is also the most common cancer in children younger than 15.
- **Lung Cancer:** Lung cancer includes two main types: non-small cell lung cancer and small cell lung cancer. Smoking causes most lung cancers, but nonsmokers can also develop lung cancer.
- **Melanoma:** Skin cancer is the most common type of cancer. The main types of skin cancer are squamous cell carcinoma, basal cell carcinoma, and melanoma. Melanoma is much less common than the other types but much more likely to invade nearby tissue and spread to other parts of the body. Most deaths from skin cancer are caused by melanoma.
- **Non-Hodgkin Lymphoma:** Lymphoma is a broad term for cancer that begins in cells of the lymph system. The two main types are Hodgkin lymphoma and non-Hodgkin lymphoma (NHL). Hodgkin lymphoma can often be cured. The prognosis of NHL depends on the specific type.
- **Pancreatic Cancer:** Pancreatic cancer can develop from two kinds of cells in the pancreas: exocrine cells and neuroendocrine cells, such as islet cells. The exocrine type is more common and is usually found at an advanced stage. Pancreatic neuroendocrine tumors (islet cell tumors) are less common but have a better prognosis.
- **Prostate Cancer:** Prostate cancer is the most common cancer and the second leading cause of cancer death among men in the United States. Prostate cancer usually grows very slowly, and finding and treating it before symptoms occur may not improve men's health or help them live longer.
- **Thyroid Cancer:** Thyroid cancer can be of four main types, which vary in their aggressiveness. Anaplastic thyroid cancer is hard to cure with current treatments, whereas papillary (the most common), follicular, and medullary thyroid cancer can usually be cured.

Cancer incidence and mortality statistics reported by the American Cancer Society and other resources were used to create the list. To qualify as a common cancer for the list, the estimated annual incidence for 2016 had to be 40,000 cases or more.

The most common type of cancer on the list is breast cancer, with more than 249,000 new cases expected in the United States in 2016. The next most common cancers are lung cancer and prostate cancer.

Because colon and rectal cancers are often referred to as “colorectal cancers,” these two cancer types are combined for the list. For 2016, the estimated number of new cases of colon cancer and rectal cancer are 95,270 and 39,220, respectively, adding to a total of 134,490 new cases of colorectal cancer.

The following table gives the estimated numbers of new cases and deaths for each common cancer type:

Table 2. Cancer Types

Cancer Type	Estimated New Cases	Estimated Deaths
Bladder	76,960	16,390
Breast (Female – Male)	246,660 – 2,600	40,450 – 440
Colon and Rectal (Combined)	134,490	49,190
Endometrial	60,050	10,470
Kidney (Renal Cell and Renal Pelvis) Cancer	62,700	14,240
Leukemia (All Types)	60,140	24,400
Lung (Including Bronchus)	224,390	158,080
Melanoma	76,380	10,130
Non-Hodgkin Lymphoma	72,580	20,150
Pancreatic	53,070	41,780
Prostate	180,890	26,120
Thyroid	64,300	1,980

Risk Factors for Cancer

It is usually not possible to know exactly why one person develops cancer and another doesn't. But research has shown that certain risk factors may increase a person's chances

of developing cancer. (There are also factors that are linked to a lower risk of cancer. These are called protective factors.)

Cancer risk factors include exposure to chemicals or other substances, as well as certain behaviors. They also include things people cannot control, like age and family history. A family history of certain cancers can be a sign of a possible inherited cancer syndrome.

Most cancer risk (and protective) factors are initially identified in epidemiology studies. In these studies, scientists look at large groups of people and compare those who develop cancer with those who don't. These studies may show that the people who develop cancer are more or less likely to behave in certain ways or to be exposed to certain substances than those who do not develop cancer.

Such studies, on their own, cannot prove that a behavior or substance causes cancer. For example, the finding could be a result of chance, or the true risk factor could be something other than the suspected risk factor. But findings of this type sometimes get attention in the media, and this can lead to wrong ideas about how cancer starts and spreads.

When many studies all point to a similar association between a potential risk factor and an increased risk of cancer, and when a possible mechanism exists that could explain how the risk factor could actually cause cancer, scientists can be more confident about the relationship between the two.

The list below includes the most studied known or suspected risk factors for cancer:

- **Age**
- **Alcohol**
- **Cancer-Causing Substances**
- **Chronic Inflammation**
- **Diet**
- **Hormones**
- **Immunosuppression**
- **Infectious Agents**
- **Obesity**
- **Radiation**
- **Sunlight**
- **Tobacco**



Figure 9. CDC Advertisement

Although some of these risk factors can be avoided, others—such as growing older—cannot. Limiting your exposure to avoidable risk factors may lower your risk of developing certain cancers.

TOBACCO

Tobacco use is a leading cause of cancer and of death from cancer. People who use tobacco products or who are regularly around environmental tobacco smoke (also called secondhand smoke) have an increased risk of cancer because tobacco products and secondhand smoke have many chemicals that damage DNA.

Tobacco use causes many types of cancer, including cancer of the lung, larynx (voice box), mouth, esophagus, throat, bladder, kidney, liver, stomach, pancreas, colon and rectum, and cervix, as well as acute myeloid leukemia. People who use smokeless tobacco (snuff or chewing tobacco) have increased risks of cancers of the mouth, esophagus, and pancreas.

There is no safe level of tobacco use. People who use any type of tobacco product are strongly urged to quit. People who quit smoking, regardless of their age, have substantial gains in life expectancy compared with those who continue to smoke. Also, quitting smoking at the time of a cancer diagnosis reduces the risk of death.

Scientists believe that cigarette smoking causes about **30% of all cancer deaths** in the United States.

Cancer Prevention

The number of new cancer cases can be reduced and many cancer deaths can be prevented. Research shows that screening for cervical and colorectal cancers as recommended helps prevent these diseases by finding precancerous lesions so they can be treated before they become cancerous. Screening for cervical, colorectal, and breast cancers also helps find these diseases at an early stage, when treatment works best.

Vaccines (shots) also help lower cancer risk. The human papillomavirus (HPV) vaccine helps prevent most cervical cancers and several other kinds of cancer, and the hepatitis B vaccine can help lower liver cancer risk.

A person's cancer risk can be reduced with healthy choices like avoiding tobacco, limiting alcohol use, protecting your skin from the sun and avoiding indoor tanning, eating a diet rich in fruits and vegetables, keeping a healthy weight, and being physically active.

Avoiding Tobacco

Cigarette Smoking

Lung cancer is the leading cause of cancer death, and cigarette smoking causes almost all cases. Compared to nonsmokers, current smokers are about 25 times more likely to die from lung cancer. Smoking causes about 80% to 90% of lung cancer deaths. Smoking also causes cancer of the mouth and throat, esophagus, stomach, colon, rectum, liver, pancreas, voicebox (larynx), trachea, bronchus, kidney and renal pelvis, urinary bladder, and cervix, and causes acute myeloid leukemia.

Visit smokefree.gov to learn how you can quit smoking.

Secondhand Smoke

Adults who are exposed to secondhand smoke at home or at work increase their risk of developing lung cancer by 20% to 30%. Concentrations of many cancer-causing and toxic chemicals are higher in secondhand smoke than in the smoke inhaled by smokers.

Protecting Your Skin

Skin cancer is the most common kind of cancer in the United States. Exposure to ultraviolet (UV) rays from the sun and tanning beds appears to be the most important environmental factor involved with developing skin cancer. To help prevent skin cancer while still having fun outdoors, protect yourself by seeking shade, applying sunscreen, and wearing sun-protective clothing, a hat, and sunglasses.

DETECTING MELANOMA

Melanoma is the most serious type of skin cancer. Often the first sign of melanoma is a change in the size, shape, color, or feel of a mole. Most melanomas have a black or black-blue area. Melanoma may also appear as a new mole. It may be black, abnormal, or "ugly looking."

Thinking of "ABCDE" can help you remember what to watch for:

- **Asymmetry** – the shape of one half does not match the other
- **Border** – the edges are ragged, blurred or irregular

- **Color** – the color is uneven and may include shades of black, brown and tan
- **Diameter** – there is a change in size, usually an increase (larger than 6 millimeters or about 1/4 inch)
- **Evolving** – the mole has changed (in size, color, shape; it may start to itch or bleed) over the past few weeks or months

Limiting Alcohol Intake

Drinking alcohol raises the risk of some cancers. Drinking any kind of alcohol can contribute to cancers of the mouth and throat, larynx (voice box), esophagus, colon and rectum, liver, and breast (in women). The less alcohol you drink, the lower the risk of cancer.

Studies around the world have shown that drinking alcohol regularly increases the risk of getting mouth, voice box, and throat cancers.

A large number of studies provide strong evidence that drinking alcohol is a risk factor for primary liver cancer, and more than 100 studies have found an increased risk of breast cancer with increasing alcohol intake. The link between alcohol consumption and colorectal (colon) cancer has been reported in more than 50 studies.

Keeping a Healthy Weight

Research has shown that being overweight or obese substantially raises a person's risk of getting endometrial (uterine), breast, prostate, and colorectal cancers. Overweight is defined as a body mass index (BMI) of 25 to 29, and obesity is defined as a BMI of 30 or higher. You can learn more about eating healthy and maintaining a healthy weight in chapters 9 and 10.

Types of Cancer Treatment



Figure 10. Source: National Cancer Institute - <https://www.cancer.gov/about-cancer/treatment/types>

There are many types of cancer treatment. The types of treatment will depend on the type of cancer and how advanced it is. Some people with cancer will have only one treatment. But most people have a combination of treatments, such as surgery with chemotherapy and/or radiation therapy.

Surgery

When used to treat cancer, surgery is a procedure in which a surgeon removes cancer from your body. Learn the different ways that surgery is used against cancer and what you can expect before, during, and after surgery.

Radiation Therapy

Radiation therapy is a type of cancer treatment that uses high doses of radiation to kill cancer cells and shrink tumors. Learn about the types of radiation, why side effects happen, which ones you might have, and more.

Chemotherapy

Chemotherapy is a type of cancer treatment that uses drugs to kill cancer cells. Learn how chemotherapy works against cancer, why it causes side effects, and how it is used with other cancer treatments.

Immunotherapy

Immunotherapy is a type of treatment that helps your immune system fight cancer. Get information about the types of immunotherapy and what you can expect during treatment.

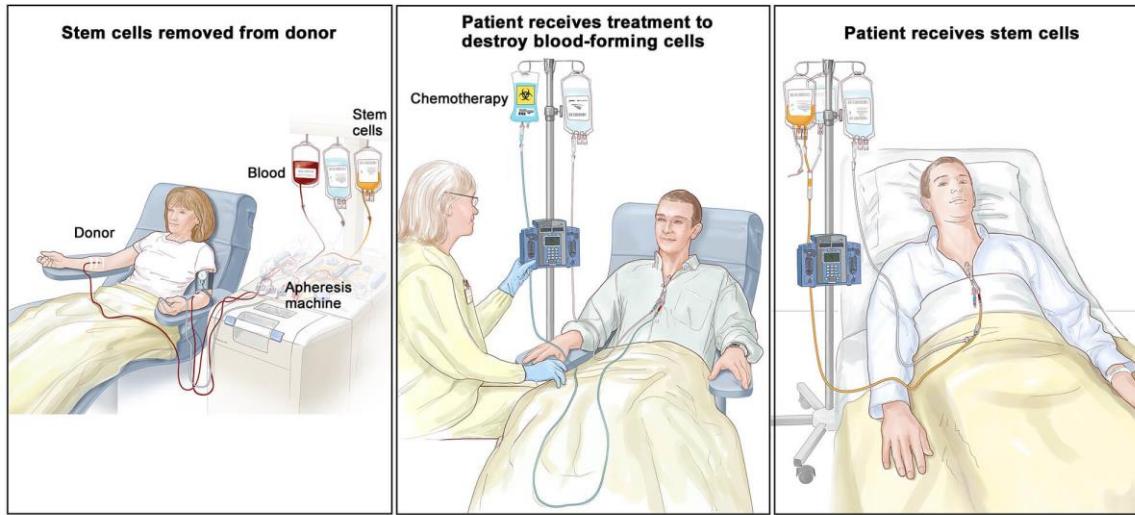
Targeted Therapy

Targeted therapy is a type of cancer treatment that targets the changes in cancer cells that help them grow, divide, and spread. Learn how targeted therapy works against cancer and about common side effects that may occur.

Hormone Therapy

Hormone therapy is a treatment that slows or stops the growth of breast and prostate cancers that use hormones to grow. Learn about the types of hormone therapy and side effects that may happen.

Stem Cell Transplant



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Figure 11. Stem Cell Transplant

Stem cell transplants are procedures that restore blood-forming stem cells in cancer patients who have had theirs destroyed by very high doses of chemotherapy or radiation therapy. Learn about the types of transplants, side effects that may occur, and how stem cell transplants are used in cancer treatment.

Precision Medicine

Precision medicine helps doctors select treatments that are most likely to help patients based on a genetic understanding of their disease. Learn about the role precision medicine plays in cancer treatment, including how genetic changes in a person's cancer are identified and used to select treatments.

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CHAPTER 13: Environmental Health

Environmental health is the branch of public health that is concerned with all aspects of the natural and built environment that may affect human health. Health is the science, practice, and study of a human's well-being and their health and preventing illnesses and human injuries. Other terms referring to or concerning environmental health are environmental public health, and public health protection / environmental health protection. Environmental health and environmental protection are very much related. Environmental health is focused on the natural and built environments for the benefit of human health, whereas environmental protection is concerned with protecting the natural environment for the benefit of human health and the ecosystem. Research in the environmental health field tries to limit the harmful exposures through natural things such as soil, water, air food, etc.

The natural environment encompasses all living and non-living things occurring naturally, meaning in this case not artificial. The term is most often applied to the Earth or some parts of Earth. This environment encompasses the interaction of all living species, climate, weather, and natural resources that affect human survival and economic activity. The concept of the natural environment can be distinguished as components:

- Complete ecological units that function as natural systems without massive civilized human intervention, including all vegetation, microorganisms, soil, rocks, atmosphere, and natural phenomena that occur within their boundaries and their nature
- Universal natural resources and physical phenomena that lack clear-cut boundaries, such as air, water, and climate, as well as energy, radiation, electric charge, and magnetism, not originating from civilized human activity

In contrast to the natural environment is the built environment. In such areas where man has fundamentally transformed landscapes such as urban settings and agricultural land conversion, the natural environment is greatly modified into a simplified human environment. Even acts which seem less extreme, such as building a mud hut or a photovoltaic system in the desert, modify the natural environment into an artificial one. Though many animals build things to provide a better environment for themselves, they are not human, hence beaver dams and the works of Mound-building termites are thought of as natural.

People seldom find absolutely natural environments on Earth, and naturalness usually varies in a continuum, from 100% natural in one extreme to 0% natural in the other. More precisely, we can consider the different aspects or components of an environment, and see that their degree of naturalness is not uniform.^[2] If, for instance, in an agricultural field, the mineralogic composition and the structure of its soil are similar to those of an undisturbed forest soil, but the structure is quite different.

The carrying capacity of a biological species in an environment is the maximum population size of the species that the environment can sustain indefinitely, given the food, habitat, water, and other necessities available in the environment. In population biology, carrying capacity is defined as the environment's maximal load,^[1] which is different from the concept of population equilibrium. Its effect on population dynamics may be approximated in a logistic model, although this simplification ignores the possibility of overshoot which real systems may exhibit.

Carrying capacity was originally used to determine the number of animals that could graze on a segment of land without destroying it. Later, the idea was expanded to more complex populations, like humans. For the human population, more complex variables such as sanitation and medical care are sometimes considered as part of the necessary establishment. As population density increases, birth rate often decreases and death rate typically increases. The difference between the birth rate and the death rate is the "natural increase". The carrying capacity could support a positive natural increase or could require a negative natural increase. Thus, the carrying capacity is the number of individuals an environment can support without significant negative impacts to the given organism and its environment. Below carrying capacity, populations typically increase, while above, they typically decrease. A factor that keeps population size at equilibrium is known as a regulating factor. Population size decreases above carrying capacity due to a range of factors depending on the species concerned, but can include insufficient space, food supply, or sunlight. The carrying capacity of an environment may vary for different species and may change over time due to a variety of factors including: food availability, water supply, environmental conditions and living space. The origins of the term "carrying capacity" are uncertain, with researchers variously stating that it was used "in the context of international shipping" or that it was first used during 19th-century laboratory experiments with micro-organisms. A recent review finds the first use of the term in an 1845 report by the US Secretary of State to the US Senate.

Section 13.1 Overpopulation

Human overpopulation occurs when the ecological footprint of a human population in a specific geographical location exceeds the carrying capacity of the place occupied by that group. Overpopulation can further be viewed, in a long term perspective, as existing when a population cannot be maintained given the rapid depletion of non-renewable resources or given the degradation of the capacity of the environment to give support to the population.

The term *human overpopulation* refers to the relationship between the entire human population and its environment: the Earth, or to smaller geographical areas such as countries. Overpopulation can result from an increase in births, a decline in mortality rates, an increase in immigration, or an unsustainable biome and depletion of resources. It is possible for very sparsely populated areas to be overpopulated if the area has a non-existent capability to sustain life (e.g. a desert). Advocates of population moderation cite issues like quality of life, carrying capacity and risk of starvation as a basis to argue against continuing high human population growth and for population decline. Scientists suggest

that the human impact on the environment as a result of overpopulation, profligate consumption and proliferation of technology has pushed the planet into a new geological epoch known as the Anthropocene.

Section 13.2 Air Pollution

Air pollution occurs when harmful substances including particulates and biological molecules are introduced into Earth's atmosphere. It may cause diseases, allergies or death of humans; it may also cause harm to other living organisms such as animals and food crops, and may damage the natural or built environment. Human activity and natural processes can both generate air pollution.

Indoor air pollution and poor urban air quality are listed as two of the world's worst toxic pollution problems in the 2008 Blacksmith Institute World's Worst Polluted Places report. According to the 2014 World Health Organization report, air pollution in 2012 caused the deaths of around 7 million people worldwide, an estimate roughly matched by the International Energy Agency.

An air quality index (AQI) is a number used by government agencies to communicate to the public how polluted the air currently is or how polluted it is forecast to become. As the AQI increases, an increasingly large percentage of the population is likely to experience increasingly severe adverse health effects. Different countries have their own air quality indices, corresponding to different national air quality standards. Some of these are the Air Quality Health Index (Canada), the Air Pollution Index (Malaysia), and the Pollutant Standards Index (Singapore).

Indoor air quality (IAQ) is a term that refers to the air quality within and around buildings and structures, especially as it relates to the health and comfort of building occupants. IAQ can be affected by gases (including carbon monoxide, radon, volatile organic compounds), particulates, microbial contaminants (mold, bacteria), or any mass or energy stressor that can induce adverse health conditions. Source control, filtration and the use of ventilation to dilute contaminants are the primary methods for improving indoor air quality in most buildings. Residential units can further improve indoor air quality by routine cleaning of carpets and area rugs.

Determination of IAQ involves the collection of air samples, monitoring human exposure to pollutants, collection of samples on building surfaces, and computer modelling of air flow inside buildings.

IAQ is part of indoor environmental quality (IEQ), which includes IAQ as well as other physical and psychological aspects of life indoors (e.g., lighting, visual quality, acoustics, and thermal comfort).

Indoor air pollution in developing nations is a major health hazard.^[2] A major source of indoor air pollution in developing countries is the burning of biomass (e.g. wood, charcoal,

dung, or crop residue) for heating and cooking.^[3] The resulting exposure to high levels of particulate matter resulted in between 1.5 million and 2 million deaths in 2000.^[4]

Section 13.3 Climate Change

Climate change is a change in the statistical distribution of weather patterns when that change lasts for an extended period of time (i.e., decades to millions of years). Climate change may refer to a change in average weather conditions, or in the time variation of weather within the context of longer-term average conditions. Climate change is caused by factors such as biotic processes, variations in solar radiation received by Earth, plate tectonics, and volcanic eruptions. Certain human activities have been identified as primary causes of ongoing climate change, often referred to as ***global warming***.

Global warming is the observed century-scale rise in the average temperature of the Earth's climate system and its related effects. Multiple lines of scientific evidence show that the climate system is warming. Many of the observed changes since the 1950s are unprecedented in the instrumental temperature record which extends back to the mid-19th century, and in paleoclimate proxy records covering thousands of years.

In 2013, the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report concluded that "It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century." The largest human influence has been the emission of greenhouse gases such as carbon dioxide, methane and nitrous oxide. Climate model projections summarized in the report indicated that during the 21st century, the global surface temperature is likely to rise a further 0.3 to 1.7 °C (0.5 to 3.1 °F) in the lowest emissions scenario, and 2.6 to 4.8 °C (4.7 to 8.6 °F) in the highest emissions scenario. These findings have been recognized by the national science academies of the major industrialized nations and are not disputed by any scientific body of national or international standing.

Future climate change and associated impacts will differ from region to region around the globe. Anticipated effects include increasing global temperatures, rising sea levels, changing precipitation, and expansion of deserts in the subtropics. Warming is expected to be greater over land than over the oceans and greatest in the Arctic, with the continuing retreat of glaciers, permafrost and sea ice. Other likely changes include more frequent extreme weather events such as heat waves, droughts, heavy rainfall with floods and heavy snowfall; ocean acidification; and species extinctions due to shifting temperature regimes. Effects significant to humans include the threat to food security from decreasing crop yields and the abandonment of populated areas due to rising sea levels.^{[17][18]} Because the climate system has a large "inertia" and greenhouse gases will remain in the atmosphere for a long time, many of these effects will persist for not only decades or centuries, but for tens of thousands of years to come.

Possible societal responses to global warming include mitigation by emissions reduction, adaptation to its effects, building systems resilient to its effects, and possible future climate engineering. Most countries are parties to the United Nations Framework Convention on

Climate Change (UNFCCC),^[20] whose ultimate objective is to prevent dangerous anthropogenic climate change.^[21] Parties to the UNFCCC have agreed that deep cuts in emissions are required^[22] and that global warming should be limited to well below 2.0 °C (3.6 °F) compared to pre-industrial levels,^[b] with efforts made to limit warming to 1.5 °C (2.7 °F).^[24]

Section 13.4 Water

Drought is a natural phenomenon during which regions or communities experience shifts in the balance between precipitation and evapotranspiration (the processes of evaporation and transpiration)—a balance that is inherent to the earth’s water cycle (see the Understanding Natural Cycles in Water Distribution section). Several factors affect the impact of drought on humans and other life forms, including the timing of precipitation events, effectiveness of the rain that is falling (i.e., rainfall intensity and the number of rain events), characteristics of the built environment in the affected area, and local demand for water. Individual areas or communities can be affected differently by drought depending on several additional variables, including:

- the structure and capacity of existing water systems,
- economic development,
- the at-risk populations living within the affected area,
- local governance of water use, and
- other societal factors, such as the presence of local social networks.

Because the conditions that signify drought can vary substantially by U.S. region and locality, drought should ultimately be defined based on the context and location in which the water shortage is occurring.

Although drought most commonly is defined climatologically, drought can also be exacerbated by human activities. For example, even when precipitation is occurring at average rates within a specific area, urban expansion and development without regard to existing water supply and water system capacity can trigger a human-induced drought. Drought can occur anywhere in the world, and it is considered a transient environmental hazard except in arid geographical regions that historically receive very limited amounts of rainfall. In addition, because of the substantial amount of time that elapses between the warning signs of drought and any measurable negative consequences to human and environmental health, drought should be considered a chronic or “low rise” natural event rather than an acute emergency for public health preparedness and response purposes. Drought is unlike other natural emergencies such as hurricanes, floods, or earthquakes; drought-related conditions can take years to escalate to the point at which water supply becomes severely limited, and the length of time that drought conditions may persist and impact communities is unknown.

Water Recycling and Reuse

Because freshwater is only a minimal percentage of the total global water supply and water treatment and distribution are costly, water should be considered a scarce and valuable resource. Many groups are advocating new approaches to water use and distribution. For example, the U.S. Green Building Council has proposed that traditional water distribution systems could be modified to limit the distribution of potable water and that parallel systems be developed to enable the collection and redistribution of gray water. Some municipalities have installed distribution systems that encourage households and commercial operations to use recycled water in lieu of treated freshwater for specific applications (e.g., irrigation), thus conserving the freshwater that is available within their watersheds. However, this is an expensive option because it requires the establishment of separate piping systems for the recycled water. Alternative methods for using rainwater also are being developed. For example, buildings are increasingly being engineered with the capability to collect and use rainwater for non-potable applications (such as for flushing toilets and landscape irrigation).

Section 13.5 Waste Management

Waste management or waste disposal are all the activities and actions required to manage waste from its inception to its final disposal.^[1] This includes amongst other things collection, transport, treatment and disposal of waste together with monitoring and regulation. It also encompasses the legal and regulatory framework that relates to waste management encompassing guidance on recycling.

The term normally relates to all kinds of waste, whether generated during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, or other human activities,^[1] including municipal (residential, institutional, commercial), agricultural, and social (health care, household hazardous waste, sewage sludge).^[2] Waste management is intended to reduce adverse effects of waste on health, the environment or aesthetics.

Waste management practices are not uniform among countries (developed and developing nations); regions (urban and rural area), and sectors (residential and industrial).^[3]

Waste Hierarchy

The waste hierarchy refers to the "3 Rs" reduce, reuse and recycle, which classify waste management strategies according to their desirability in terms of waste minimization. The waste hierarchy remains the cornerstone of most waste minimization strategies. The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste; see: resource recovery. The waste hierarchy is represented as a pyramid because the basic premise is for policy to take action first and prevent the generation of waste. The next step or preferred action is to reduce the generation of waste i.e. by re-use. The next is recycling which would include composting. Following this step is material recovery and waste-to-energy. Energy can be recovered from processes i.e. landfill and combustion, at this level of the hierarchy. The final action is disposal, in landfills or through incineration without energy recovery. This last step is the final resort for waste which has not been prevented, diverted or recovered.^{[5][page needed]} The

waste hierarchy represents the progression of a product or material through the sequential stages of the pyramid of waste management. The hierarchy represents the latter parts of the life-cycle for each product.

Noise Pollution

Noise pollution is the disturbing noise with harmful impact on the activity of human or animal life. The source of outdoor noise worldwide is mainly caused by machines and transportation systems, motor vehicles engines and trains. Outdoor noise is summarized by the word environmental noise. Poor urban planning may give rise to noise pollution, side-by-side industrial and residential buildings can result in noise pollution in the residential areas. Documented problems associated with urban environment noise go back as far as Ancient Rome. Noise from roadways and other urban factors can be mitigated by urban planning and better design of roads.

Outdoor noise can be caused by machines, construction activities, and music performances, especially in some workplaces. Noise-induced hearing loss can be caused by outside (e.g. trains) or inside (e.g. music) noise. High noise levels can contribute to cardiovascular effects in humans and an increased incidence of coronary artery disease. In animals, noise can increase the risk of death by altering predator or prey detection and avoidance, interfere with reproduction and navigation, and contribute to permanent hearing loss.^[5]

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CHAPTER 14: Health Care Choices

Section 14.1 Understanding your Health Care Choices

Developing Health Literacy

The U.S. Department of Health and Human Services (HHS) defines **health literacy** as "The degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions." In a recent report by the HHS, improved consumer health literacy was determined to be an important component of health communication, medical product safety, and oral health.

Health literacy includes the ability to understand instructions on prescription drug bottles, appointment slips, medical education brochures, doctor's directions and consent forms, and the ability to negotiate complex health care systems. Health literacy is not simply the ability to read. It requires a complex group of reading, listening, analytical, and decision-making skills, and the ability to apply these skills to health situations.

Health literacy varies by context and setting and is not necessarily related to years of education or general reading ability. A person who functions adequately at home or work may have marginal or inadequate literacy in a health care environment. With the move towards a more "consumer-centric" health care system as part of an overall effort to improve the quality of health care and to reduce health care costs, individuals need to take an even more active role in health care related decisions. To accomplish this people need strong health information skills.

Skills Needed for Health Literacy

Patients are often faced with complex information and treatment decisions. Some of the specific tasks patients are required to carry out may include:

- evaluating information for credibility and quality,
- analyzing relative risks and benefits,
- calculating dosages,
- interpreting test results, or
- locating health information.

In order to accomplish these tasks, individuals may need to be:

- visually literate (able to understand graphs or other visual information),
- computer literate (able to operate a computer),
- information literate (able to obtain and apply relevant information), and
- numerically or computationally literate (able to calculate or reason numerically).

Oral language skills are important as well. Patients need to articulate their health concerns and describe their symptoms accurately. They need to ask pertinent questions, and they need to understand spoken medical advice or treatment directions. In an age of shared

responsibility between physician and patient for health care, patients need strong decision-making skills. With the development of the Internet as a source of health information, health literacy may also include the ability to search the Internet and evaluate websites. According to the American Medical Association, poor health literacy is "a stronger predictor of a person's health than age, income, employment status, education level, and race." In *Health Literacy: A Prescription to End Confusion*, the Institute of Medicine reports that ninety million people in the United States, nearly half the population, have difficulty understanding and using health information. As a result, patients often take medicines on erratic schedules, miss follow-up appointments, and do not understand instructions like "take on an empty stomach."

Vulnerable populations include:

- Elderly (age 65+) - Two thirds of U.S. adults age 60 and over have inadequate or marginal literacy skills, and 81% of patients age 60 and older at a public hospital could not read or understand basic materials such as prescription labels
- Minority populations
- Immigrant populations
- Low income - Approximately half of Medicare/Medicaid recipients read below the fifth-grade level
- People with chronic mental and/or physical health conditions

Reasons for limited literacy skills include:

- Lack of educational opportunity - people with a high school education or lower
- Learning disabilities
- Cognitive declines in older adults
- Use it or lose it - Reading abilities are typically three to five grade levels below the last year of school completed. Therefore, people with a high school diploma, typically read at a seventh or eighth grade reading level.

The relationship between literacy and health is complex. Literacy impacts health knowledge, health status, and access to health services. Health status is influenced by several related socioeconomic factors. Literacy impacts income level, occupation, education, housing, and access to medical care. The poor and illiterate are more likely to work under hazardous conditions or be exposed to environmental toxins.

Economic Impact of Low Health Literacy

In addition to the effects of low health literacy on the individual patient, there are economic consequences of low health literacy to society. After adjusting for health status, education level, socioeconomic status, and other demographics factors, people with low functional literacy have less ability to care for chronic conditions and use more health care services.

Why Does Health Literacy Matter?

Every day, people confront situations that involve life-changing decisions about their

health. These decisions are made in places such as grocery and drug stores, workplaces, playgrounds, doctors' offices, clinics and hospitals, and around the kitchen table. Obtaining, communicating, processing, and understanding health information and services are essential steps in making appropriate health decisions; however, research indicates that today's health information is presented in ways that are not usable by most adults. "Limited health literacy" occurs when people can't find and use the health information and services they need.

- Nearly 9 out of 10 adults have difficulty using the everyday health information that is routinely available in our healthcare facilities, retail outlets, media and communities.
- Without clear information and an understanding of the information's importance, people are more likely to skip necessary medical tests, end up in the emergency room more often, and have a harder time managing chronic diseases like diabetes or high blood pressure.

Who Does Limited Health Literacy Affect? Who is affected?

People of all ages, races, incomes, and education levels can find it difficult to obtain, communicate, process and understand health information and services. Literacy skills are only a part of health literacy. Even people with strong reading and writing skills can face health literacy challenges when -

- They are not familiar with medical terms or how their bodies work.
- They have to interpret or calculate numbers or risks that could have immediate effects on their health and safety.
- They are voting on a critical local issue affecting the community's health and are relying on unfamiliar technical information.
- They are diagnosed with a serious illness and are scared or confused. They have health conditions that require complicated self-care.

Health Promotion and Self Care

Ideally we adopt behaviors and practices that promote health and prevent chronic disease. Through education and health promotion we learn behaviors and practices to manage our own basic health care. Health promotion involves education, policy, and support that helps us to make health choices and promote positive behavior and self-care. Self-care and health promotion involve the following:

- health prevention practices, which help limit our need for formal interventions; we manage minor health concerns informally using self-care.
- primary prevention such as brushing our teeth, breast and testicular self exam, vaccinations, etc.
- managing uncomplicated injuries or illnesses with self diagnosis and treatment
- using home remedies and OTC drugs.

Self Care versus Formal Care

The World Health Organization defines self-care in the following way:

'Self-Care is what people do for themselves to establish and maintain health, and to prevent and deal with illness. It is a broad concept encompassing hygiene (general and personal), nutrition (type and quality of food eaten), lifestyle (sporting activities, leisure etc), environmental factors (living conditions, social habits, etc.) socio-economic factors (income level, cultural beliefs, etc.) and self-medication.'

Self-care improves as we come to know our body and pay attention to the signals it gives us so we can take appropriate actions. Self-care helps us rely less on formal medical intervention. When we are more knowledgeable about our body and health issues we are better able to make better decisions about self-care and seeking formal care.

Examples of self-care are:

- a. Recognition of symptoms or conditions that occur frequently but may not require a doctor's visit
- b. Performing monthly breast and testicular self-exams
- c. Learning first aid for common, uncomplicated injuries and conditions
- d. Checking blood pressure, pulse, and temperature
- e. Using home pregnancy tests, ovulation kits and HIV test kits
- f. Doing periodic checks for blood cholesterol
- g. Using home stool test kits for early colon cancer detection
- h. Using self-help books, tapes, websites, and videos
- i. Benefiting from relaxation techniques, including meditation, nutrition, rest, and exercise

Formal Care: Health care professionals often need to be consulted if there is a serious accident or injury, severe trauma, sudden onset of symptoms, or if any symptoms are unusual and recur over time. Formal Care is accessing a local provider through a community or privatized hospital, clinic or medical practice. Formal Care is best and most effective when you are an *active participant* and informed. A partnership between the patient and health care provider is desirable. The goal should be an exchange of information and coordination on interventions and solutions. Formal Care is enhanced through *health literacy*.

Section 14.2 How to Read Health News

If you've just read a health-related headline that has caused you to spit out your morning coffee ("Coffee causes cancer" usually does the trick), it's always best to follow the Blitz slogan: "Keep Calm and Carry On". On reading further, you'll often find the headline has left out something important, such as, "Injecting five rats with really highly concentrated coffee solution caused some changes in cells that might lead to tumors eventually. (Study funded

by The Association of Tea Marketing)".

The most important rule to remember is: don't automatically believe the headline. It is there to draw you into buying the paper and reading the story. Would you read an article called, "Coffee pretty unlikely to cause cancer, but you never know"? Probably not.

To avoid spraying your newspaper with coffee in the future, you need to analyze the article to see what it says about the research it is reporting on. Consider the following questions to help you figure out which articles you're going to believe and which you're not.

Does the article support its claims with scientific research?

Your first concern should be the research behind the news article. If an article touts a treatment or some aspect of your lifestyle that is supposed to prevent or cause a disease, but doesn't give any information about the scientific research behind it, then treat it with a lot of caution. The same applies to research that has yet to be published.

Is the article based on a conference abstract?

Another area for caution is if the news article is based on a conference abstract. Research presented at conferences is often at a preliminary stage and usually hasn't been scrutinized by experts in the field. Also, conference abstracts rarely provide full details about methods, making it difficult to judge how well the research was conducted. For these reasons, articles based on conference abstracts should be no cause for alarm. Don't panic or rush off to your doctor.

Was the research in humans?

Quite often, the "miracle cure" in the headline turns out to have only been tested on cells in the laboratory or on animals. These stories are regularly accompanied by pictures of humans, which creates the illusion that the miracle cure came from human studies. Studies in cells and animals are crucial first steps and should not be undervalued. However, many drugs that show promising results in cells in laboratories don't work in animals, and many drugs that show promising results in animals don't work in humans. If you read a headline about a drug or food "curing" rats, there is a chance it might cure humans in the future, but unfortunately a larger chance that it won't. So there is no need to start eating large amounts of the "wonder food" featured in the article.

How many people did the research study include?

In general, the larger a study the more you can trust its results. Small studies may miss important differences because they lack statistical "power", and are also more susceptible to finding things (including things that are wrong) purely by chance.

You can visualize this by thinking about tossing a coin. We know that if we toss a coin the chance of getting a head is the same as that of getting a tail - 50/50. However, if we didn't know this and we tossed a coin four times and got three heads and one tail, we might conclude that getting heads was more likely than tails. But this chance finding would be wrong. If we tossed the coin 500 times - i.e. gave the experiment more "power" - we'd be

more likely to get a heads/tails ratio close to 50/50, giving us a better idea of the true odds. When it comes to sample sizes, bigger is usually better. So when you see a study conducted in a handful of people, treat it with caution.

Did the study have a control group?

There are many different types of studies appropriate for answering different types of questions. If the question being asked is about whether a treatment or exposure has an effect or not, then the study needs to have a control group. A control group allows the researchers to compare what happens to people who have the treatment/exposure with what happens to people who don't. If the study doesn't have a control group, then it's difficult to attribute results to the treatment or exposure with any level of certainty.

Also, it's important that the control group is as similar to the treated/exposed group as possible. The best way to achieve this is to randomly assign some people to be in the treated/ exposed group and some people to be in the control group. This is what happens in a randomized controlled trial (RCT) and is why RCTs are considered the "gold standard" for testing the effects of treatments and exposures. So when reading about a drug, food or treatment that is supposed to have an effect, you want to look for evidence of a control group, and ideally, evidence that the study was an RCT. Without either, retain some healthy skepticism.

Did the study actually assess what's in the headline?

This one is a bit tricky to explain without going into a lot of detail about things called proxy outcomes. Instead, bear in mind this key point: the research needs to have examined what is being talked about in the headline and article. (Somewhat alarmingly, this isn't always the case.)

For example, you might read a headline that claims, "Tomatoes reduce the risk of heart attacks". What you need to look for is evidence that the study actually looked at heart attacks. You might instead see that the study found that tomatoes reduce blood pressure. This means that someone has extrapolated that tomatoes must also have some impact on heart attacks, as high blood pressure is a risk factor for heart attacks. Sometimes these extrapolations will prove to be true, but other times they won't. Therefore if a news story is focusing on a health outcome that was not examined by the research, treat it with a pinch of salt.

Who paid for and conducted the study?

This is a somewhat cynical point, but one that's worth making. The majority of trials today are funded by manufacturers of the product being tested – be it a drug, vitamin cream or foodstuff. This means they have a vested interest in the results of the trial, which can potentially affect what the researchers find and report in all sorts of conscious and unconscious ways. This is not to say that all manufacturer-sponsored trials are unreliable. Many are very good. However, it's worth seeing who funded the study to sniff out a potential conflict of interest.

Should you "shoot the messenger"?

Overblown claims might not necessarily be due to the news reporting itself. Although journalists can sometimes misinterpret a piece of research, at other times the researchers (or other interested parties) over-extrapolate, making claims their research doesn't support. These claims are then repeated by the journalists.

Given that erroneous claims can come from a variety of places, don't automatically assume they come from the journalist. Instead, use the questions above to figure out for yourself what you're going to believe and what you're not.

How and Where to Find Reliable Health Information on the Internet

The Healthfinder website (<http://www.healthfinder.gov>) is the federal government's gateway for reliable information from U.S. government agencies and other organizations. The site displays selected resources of consumer health and human services information. Here is an example of a source that has been reviewed and found reliable and credible:

[MedlinePlus Guide to Healthy Web Surfing](#)

The Social Life of Health Information

Where do you go for health information? According to the Pew Research Center, most people seek information from doctors, nurses, and other health professionals first but the Internet and peers are also a significant source.

The Pew Research Center conducted a telephone survey in 2010 to find out how Americans are getting their health information.

"The survey finds that, of the 74% of adults who use the internet:

- 80% of internet users have looked online for information about any of 15 health topics such as a specific disease or treatment. This translates to 59% of all adults.
- 34% of internet users, or 25% of adults, have read someone else's commentary or experience about health or medical issues on an online news group, website, or blog.
- 25% of internet users, or 19% of adults, have watched an online video about health or medical issues.
- 24% of internet users, or 18% of adults, have consulted online reviews of particular drugs or medical treatments.
- 18% of internet users, or 13% of adults, have gone online to find others who might have health concerns similar to theirs.
- 16% of internet users, or 12% of adults, have consulted online rankings or reviews of doctors or other providers.
- 15% of internet users, or 11% of adults, have consulted online rankings or reviews of hospitals or other medical facilities.

Of those who use social network sites (62% of adult internet users, or 46% of all adults):

- 23% of social network site users, or 11% of adults, have followed their friends' personal health experiences or updates on the site.
- 17% of social network site users, or 8% of adults, have used social networking sites to remember or memorialize other people who suffered from a certain health condition.
- 15% of social network site users, or 7% of adults, have gotten any health information on the sites."

Section 14.3 Health Care Choices: The Affordable Health Care Act (ACA)

Health care choices in the United States can be broadly divided into two main categories: public health care (government-funded) and private health care (privately funded). The two main publicly funded health care programs are Medicare, which provides health services to people over 65 years old as well as people who meet other standards for disability, and Medicaid, which provides services to people with very low incomes who meet other eligibility requirements. Other government-funded programs include service agencies focused on Native Americans (the Indian Health Service), Veterans (the Veterans Health Administration), and children (the Children's Health Insurance Program).

Health care in the United States is a complex issue, and it will remain complex with the continued enactment of the Patient Protection and Affordable Care Act (PPACA). This Act, sometimes called "ObamaCare" for its most noted advocate, former President Barack Obama, represents large-scale federal reform of the United States' health care system. It expands eligibility to programs like Medicaid and CHIP, helps guarantee insurance coverage for people with pre-existing conditions, and establishes regulations to make sure that the premium funds collected by insurers and care providers go directly to medical care. It also includes an individual mandate, which requires everyone to have insurance coverage or pay a penalty. A series of provisions, including significant subsidies, are intended to address the discrepancies in income that are currently contributing to high rates of uninsurance and underinsurance.

How much do you know the Affordable Health Care Act?

You need to be fully informed about what the PPACA provides. Here is a list of key changes to the United States health care system as a result of the PPACA:

- Insurers are prohibited from denying coverage to individuals due to pre-existing conditions.
- Premiums must be the same for everyone of a given age, regardless of preexisting conditions.
- Dependents are permitted to remain on their parents' insurance plan until their 26th birthday.
- Individuals are required to buy health insurance or pay a penalty (known as the individual mandate). This applies to everyone not covered by an employer sponsored health plan, Medicaid, Medicare or other public insurance programs

(such as Tricare). Also exempt were those facing a financial hardship or who were members in a recognized religious sect exempted by the Internal Revenue Service.

- Essential health benefits must be provided. The National Academy of Medicine defines the law's "essential health benefits" as "ambulatory patient services; emergency services; hospitalization; maternity and newborn care; mental health and substance use disorder services, including behavioral health treatment; prescription drugs; rehabilitative services and devices; laboratory services; preventive and wellness services and chronic disease management; and pediatric services, including oral and vision care" and others rated Level A or B by the U.S. Preventive Services Task Force. In determining what would qualify as an essential benefit, the law required that standard benefits should offer at least that of a "typical employer plan".
- Additional preventive care and screenings for women. This includes Well-woman visits, gestational diabetes screening for pregnant women, domestic and interpersonal violence screening and counseling, FDA-approved contraception methods, and contraceptive education and counseling, breastfeeding support, supplies, and counseling, HPV DNA testing, for women 30 or older, sexually transmitted infections counseling, and HIV screening and counseling for sexually-active women. This mandate applies to all employers and educational institutions except for religious organizations. These regulations were included on the recommendations of the Institute of Medicine.
- Annual and lifetime coverage caps on essential benefits were banned.
- Prohibits insurers from dropping policyholders when they get sick.
- All health policies sold in the United States must provide an annual maximum out-of-pocket (MOOP) payment cap for an individual's or family's medical expenses (excluding premiums). After the MOOP payment cap is reached, the insurer must pay all remaining costs.
- Preventive care, vaccinations and medical screenings cannot be subject to co-payments, co-insurance or deductibles. Specific examples of covered services include: mammograms and colonoscopies, wellness visits, gestational diabetes screening, HPV testing, STI counseling, HIV screening and counseling, contraceptive methods, breastfeeding support/supplies and domestic violence screening and counseling.
- The law established four tiers of coverage: bronze, silver, gold and platinum. All categories offer the essential health benefits. The categories vary in their division of premiums and out-of-pocket costs: bronze plans have the lowest monthly premiums and highest out-of-pocket costs, while platinum plans are the reverse. The percentages of health care costs that plans are expected to cover through premiums (as opposed to out-of-pocket costs) are, on average: 60% (bronze), 70% (silver), 80% (gold), and 90% (platinum).
- Insurers are required to implement an appeals process for coverage determination and claims on all new plans.

- Employer mandate. Businesses that employ 50 or more people but do not offer health insurance to their full-time employees pay a tax penalty if the government has subsidized a full-time employee's healthcare through tax deductions or other means. This is commonly known as the employer mandate. This provision was included to encourage employers to continue providing insurance once the exchanges began operating. Approximately 44% of the population was covered directly or indirectly through an employer.
- Insurers must spend at least 80–85% of premium dollars on health costs; rebates must be issued to policyholders if this is violated.

Many Americans worry that governmental oversight of health care represents a federal overstepping of constitutional guarantees of individual freedom. Others welcome a program that they believe will make health care accessible and affordable to everyone.

Watch this tour of the [HealthCare.gov website](#) to find out more.

Covered California

In California, the health care marketplace is called Covered California. This is where Californians can shop and compare health insurance plans under the Patient Protection and Affordable Care Act. The Department of Health Care Services sponsors Covered California to help health insurance shoppers get the coverage and care that is right for them. Visit [CoveredCA.com](#) for more information.

Section 14.4 Health Insurance: Key Terms

Part of health literacy is understanding key health insurance terms. This will allow for educated decisions when choosing a health insurance plan. Below are some basic key terms that are helpful to understand when researching health insurance plans:

In-Network Providers: health care providers who are contracted with your health insurance plan to provide services at a contracted or discounted rate.

Out-of-Network Providers: health care providers who are not contracted with your health insurance plan. Out-of-network coinsurance usually costs you more than in-network coinsurance because there is no contracted or discounted rate.

Exclusive Provider Organization (EPO): A managed care plan where services are covered only if you use doctors, specialists, or hospitals in the plan's network (except in an emergency).

Health Maintenance Organization (HMO): A type of health insurance plan that usually limits coverage to care from doctors who work for or contract with the HMO. It generally won't cover out-of-network care except in an emergency. An HMO may require you to live or work in its service area to be eligible for coverage. HMOs often provide integrated care and focus on prevention and wellness.

Point of Service (POS): A type of plan where you pay less if you use doctors, hospitals, and other health care providers that belong to the plan's network. POS plans require you to get a referral from your primary care doctor in order to see a specialist.

Preferred Provider Organization (PPO): A type of health plan where you pay less if you use providers in the plan's network. You can use doctors, hospitals, and providers outside of the network without a referral for an additional cost.

Premium: The amount paid for your health insurance every month. In addition to your premium, you usually have to pay other costs for your health care, including a deductible, copayments, and coinsurance.

Deductible: The amount you pay for covered health care services before your insurance plan starts to pay. With a \$2,000 deductible, for example, you pay the first \$2,000 of covered services yourself.

Many health insurance plans cover certain services such as check-ups, disease management, and preventive services before the deductible has been met. Family plans often have both an individual deductible, which applies to each person, and a family deductible, which applies to all family members.

Generally, plans with lower monthly premiums have higher deductibles. Plans with high monthly premiums usually have lower deductibles. Those who use their health insurance often would probably be wise to choose a plan with a slightly higher premium but a lower deductible, which may save money in the long-term.

After paying the deductible, you will usually pay only a copayment or coinsurance for covered services. Your insurance company pays the rest.

Copayment: A fixed amount (\$20, for example) you pay for a covered health care service after you've paid your deductible. Let's say your health insurance plan's allowable cost for a doctor's office visit is \$100. Your copayment for a doctor visit is \$20. If you've paid your deductible: You pay \$20, usually at the time of the visit. If you haven't met your deductible: You pay \$100, the full allowable amount for the visit.

Copayments (sometimes called "copays") can vary for different services within the same plan, like drugs, lab tests, and visits to specialists.

Coinsurance: The percentage of costs of a covered health care service you pay (20%, for example) after you've paid your deductible. Let's say your health insurance plan's allowed amount for an office visit is \$100 and your coinsurance is 20%. If you've paid your deductible: You pay 20% of \$100, or \$20. The insurance company pays the rest. If you haven't met your deductible: You pay the full allowed amount, \$100.

Out-of-pocket maximum: The most you have to pay for covered services in a plan year. After you spend this amount on deductibles, copayments, and coinsurance, your health plan pays 100% of the costs of covered benefits.

Although this is not an all-encompassing list of key terms for health insurance, these are some of the terms you are likely to encounter when shopping for health insurance.

More in-depth information can be found at [Healthcare.gov/glossary](https://www.healthcare.gov/glossary).

Section 14.5 Choices in Medical Care

Choosing the right medical professional can be difficult and will vary depending on your day-to-day health status. Below is a brief list of medical professionals you can visit for a variety of health issues:

Primary Care Practitioner (PCP) is a medical professional whom you can go to for routine ailments, preventive care, general medical advice, and appropriate referrals. The primary care provider for most people is a medically trained family practitioner, an internist, or a pediatrician.

Conventional or Allopathic medicine, or traditional Western medical practice, is based on scientifically validated methods and procedures and involves the application of the scientific method; cause and effect.

Complementary medicine and alternative medicine; unconventional practices used alongside or instead of conventional medicine. Examples include chiropractic's, massage therapy, acupuncture, acupressure, and herbal remedies.

Other PCP include

Osteopath: general practitioner who receives medical training similar to MD , but is more involved in musculoskeletal focus than internal focus.

Nurse practitioners are professional nurses with advanced training obtained through either a master's degree program or specialized nurse practitioner program. They have the authority and training to conduct diagnostic tests and prescribe medications (in some states). Nurses may also earn the clinical doctor of nursing degree (ND), a doctorate of

nursing science (DNS or DNSc), or a research-based doctorate (PhD) in nursing.

Physician assistants must work under the supervision of a physician and are legally permitted to prescribe drugs in all states.

Other practitioners:

Nurses are highly trained and strictly regulated practitioners who provide a wide range of services including patient education, counseling, community health and disease prevention information, and administration of medications.

Licensed registered nurses (RN) have completed either a 4-year program leading to a Bachelor of Science degree (BSN) or a 2-year associate degree program.

Licensed practical or vocational nurses (LPN or LVN) have completed a one- to two-year training program.

Ophthalmologist holds a medical degree and can perform surgery. An optometrist evaluates visual problems but is not a trained physician.

Podiatrist: specialize in care of the foot; extensive training similar to MD; can prescribe and perform surgery.

Dentists are specialists who diagnose and treat diseases of the teeth, gums, and oral cavity. Orthodontists are specialists in the alignment of teeth. Oral surgeons perform surgical procedures to correct problems of the mouth, face, and jaw.

Questions are the Answer

Whichever health care professional you choose to visit, your health depends on good communication. Asking questions and providing information to your doctor and other care providers can improve your care. Quality health care is a team effort. You play an important role. One of the best ways to communicate with your doctor and health care team is by asking questions. Because time is limited during medical appointments, you will feel less rushed if you prepare your questions before your appointment.

- Your doctor wants your questions.
- Doctors know a lot about a lot of things, but they don't always know everything about you or what is best for you.
- Your questions give your doctor and health care team important information about you, such as your most important health care concerns.
- That is why they need you to speak up.

Health Facilities

Health facilities are places that provide health care. They include hospitals, clinics, outpatient care centers and specialized care centers, such as birthing centers and psychiatric care centers.

When you choose a health facility, you might want to consider

- How close it is
- Whether your health insurance will pay for services there
- Whether your health care provider can treat you there
- The quality of the facility

Quality is important. Some facilities do a better job than others. One way to learn about the quality of a facility is to look at report cards developed by state and consumer groups.

Look for a hospital that:

- Is accredited by the Joint Commission on Accreditation of Healthcare Organizations (JCAHO).
- Is rated highly by the State and by consumer groups or other organizations.
- Has a lot of experience and success in treating your condition.
- Monitors quality of care and works to improve quality.

In choosing a nursing home or other long-term care facility, look for one that:

- Has been found by State agencies and other groups to provide quality care.
- Provides a level of care, including staff and services, that will meet your needs.

Choosing the right medications: Brand Name vs. Generic

You may need to take medicines every day, or only once in a while. Either way, you want to make sure that the medicines are safe and will help you get better. In the United States, the Food and Drug Administration is in charge of assuring the safety and effectiveness of both prescription and over-the-counter medicines.

Even safe drugs can cause unwanted side effects or interactions with food or other medicines you may be taking. They may not be safe during pregnancy. To reduce the risk of reactions and make sure that you get better, it is important for you to take your medicines correctly.

Understanding Generic Drugs

Generic drugs are important options that allow greater access to health care for all Americans. They are copies of brand-name drugs and are the same as those brand name drugs in dosage form, safety, strength, route of administration, quality, performance characteristics and intended use.

Health care professionals and consumers can be assured that FDA approved generic drug products have met the same rigid standards as the innovator drug. All generic drugs approved by FDA have the same high quality, strength, purity and stability as brand-name drugs. And, the generic manufacturing, packaging, and testing sites must pass the same quality standards as those of brand name drugs.

Generic Drugs: Questions and Answers

What are generic drugs?

A generic drug is identical -- or bioequivalent -- to a brand name drug in dosage form, safety, strength, route of administration, quality, performance characteristics and intended use. Although generic drugs are chemically identical to their branded counterparts, they are typically sold at substantial discounts from the branded price. According to the Congressional Budget Office, generic drugs save consumers an estimated \$8 to \$10 billion a year at retail pharmacies. Even more billions are saved when hospitals use generics.

Are generic drugs as effective as brand-name drugs?

Yes. A generic drug is the same as a brand-name drug in dosage, safety, strength, quality, the way it works, the way it is taken and the way it should be used.

FDA requires generic drugs have the same high quality, strength, purity and stability as brand-name drugs.

Not every brand-name drug has a generic drug. When new drugs are first made they have drug patents. Most drug patents are protected for 20 years. The patent, which protects the company that made the drug first, doesn't allow anyone else to make and sell the drug. When the patent expires, other drug companies can start selling a generic version of the drug. But, first, they must test the drug and the FDA must approve it.

Creating a drug costs lots of money. Since generic drug makers do not develop a drug from scratch, the costs to bring the drug to market are less; therefore, generic drugs are usually less expensive than brand-name drugs. But, generic drug makers must show that their product performs in the same way as the brand-name drug.

How are generic drugs approved?

Drug companies must submit an abbreviated new drug application (ANDA) for approval to market a generic product. The Drug Price Competition and Patent Term Restoration Act of 1984, more commonly known as the Hatch-Waxman Act, made ANDAs possible by creating a compromise in the drug industry. Generic drug companies gained greater access to the market for prescription drugs, and innovator companies gained restoration of patent life of their products lost during FDA's approval process.

New drugs, like other new products, are developed under patent protection. The patent protects the investment in the drug's development by giving the company the sole right to sell the drug while the patent is in effect. When patents or other periods of exclusivity expire, manufacturers can apply to the FDA to sell generic versions.

The ANDA process does not require the drug sponsor to repeat costly animal and clinical research on ingredients or dosage forms already approved for safety and effectiveness. This applies to drugs first marketed after 1962.

What standards do generic drugs have to meet?

Health professionals and consumers can be assured that FDA approved generic drugs have met the same rigid standards as the innovator drug. To gain FDA approval, a generic drug must:

- contain the same active ingredients as the innovator drug (inactive ingredients may vary)
- be identical in strength, dosage form, and route of administration

- have the same use indications
- be bioequivalent
- meet the same batch requirements for identity, strength, purity, and quality
- be manufactured under the same strict standards of FDA's good manufacturing practice regulations required for innovator products

Section 14.6 Alternative Medical Practices

Complementary and alternative medicine (CAM) is the term for medical products and practices that are not part of standard care. Standard care is what medical doctors, doctors of osteopathy and allied health professionals, such as registered nurses and physical therapists, practice. Alternative medicine means treatments that you use instead of standard ones. Complementary medicine means nonstandard treatments that you use along with standard ones. Examples of CAM therapies are acupuncture, chiropractic and herbal medicines.

The claims that CAM treatment providers make about their benefits can sound promising. However, researchers do not know how safe many CAM treatments are or how well they work. Studies are underway to determine the safety and usefulness of many CAM practices.

What Is Complementary and Alternative Medicine?

Many Americans use complementary and alternative medicine (CAM) in pursuit of health and well-being. The 2007 National Health Interview Survey (NHIS), which included a comprehensive survey of CAM use by Americans, showed that approximately 38 percent of adults use CAM.

Defining CAM

Defining CAM is difficult, because the field is very broad and constantly changing. NCCAM defines CAM as a group of diverse medical and health care systems, practices, and products that are not generally considered part of conventional medicine. Conventional medicine (also called Western or allopathic medicine) is medicine as practiced by holders of M.D. (medical doctor) and D.O. (doctor of osteopathic medicine) degrees and by allied health professionals, such as physical therapists, psychologists, and registered nurses. The boundaries between CAM and conventional medicine are not absolute, and specific CAM practices may, over time, become widely accepted.

"Complementary medicine" refers to use of CAM together with conventional medicine, such as using acupuncture in addition to usual care to help lessen pain. Most use of CAM by Americans is complementary. "Alternative medicine" refers to use of CAM in place of conventional medicine. "Integrative medicine" combines treatments from conventional medicine and CAM for which there is some high-quality evidence of safety and effectiveness. It is also called integrated medicine.

Types of CAM

CAM practices are often grouped into broad categories, such as natural products, mind and body medicine, and manipulative and body-based practices. Although these categories are not formally defined, they are useful for discussing CAM practices. Some CAM practices may fit into more than one category.

Natural Products

This area of CAM includes use of a variety of herbal medicines (also known as botanicals), vitamins, minerals, and other "natural products." Many are sold over the counter as dietary supplements. (Some uses of dietary supplements—e.g., taking a multivitamin to meet minimum daily nutritional requirements or taking calcium to promote bone health—are not thought of as CAM.)

CAM "natural products" also include probiotics—live microorganisms (usually bacteria) that are similar to microorganisms normally found in the human digestive tract and that may have beneficial effects. Probiotics are available in foods (e.g., yogurts) or as dietary supplements. They are not the same thing as prebiotics — nondigestible food ingredients that selectively stimulate the growth and/or activity of microorganisms already present in the body.

Interest in and use of CAM natural products have grown considerably in the past few decades. The 2007 NHIS found that 17.7 percent of American adults had used a nonvitamin/nonmineral natural product. These products were the most popular form of CAM among both adults and children. The most commonly used product among adults was fish oil/omega 3s (reported by 37.4 percent of all adults who said they used natural products); popular products for children included echinacea (37.2 percent) and fish oil/omega 3s (30.5 percent).

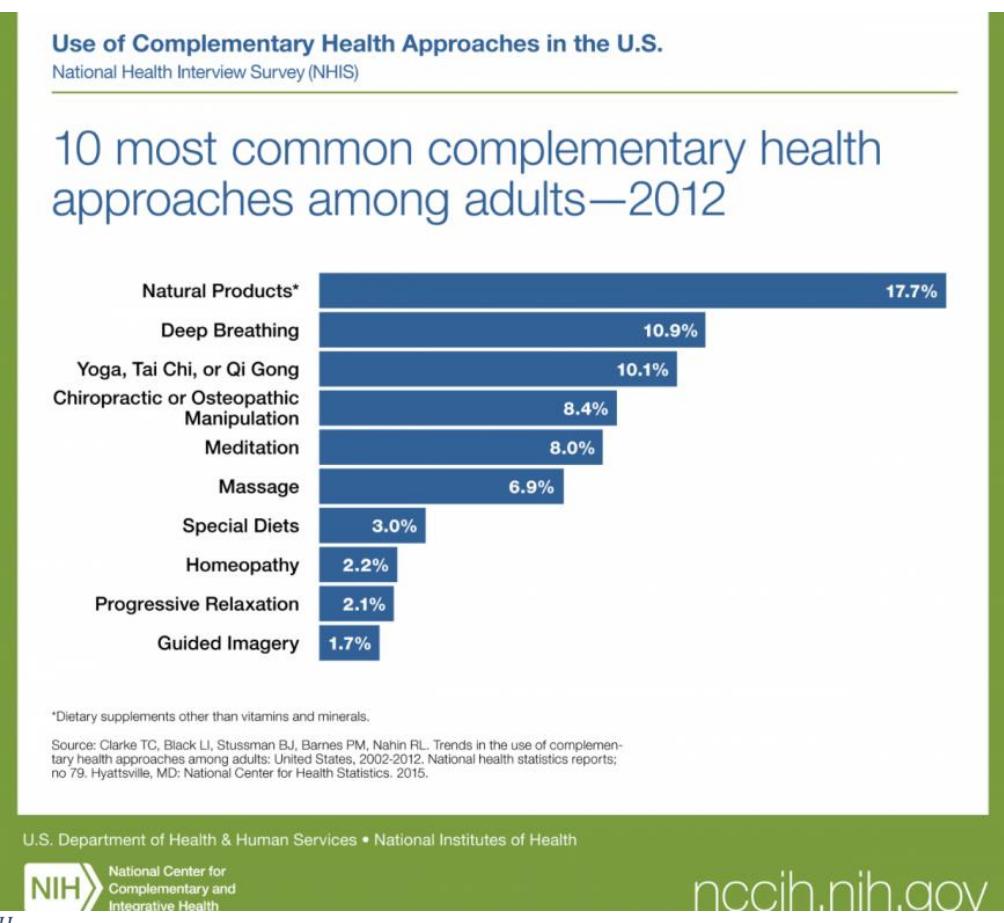


Figure 1. NIH

Mind and Body Medicine

Mind and body practices focus on the interactions among the brain, mind, body, and behavior, with the intent to use the mind to affect physical functioning and promote health. Many CAM practices embody this concept—in different ways.

- Meditation techniques include specific postures, focused attention, or an open attitude toward distractions. People use meditation to increase calmness and relaxation, improve psychological balance, cope with illness, or enhance overall health and well-being.
- The various styles of yoga used for health purposes typically combine physical postures, breathing techniques, and meditation or relaxation. People use yoga as part of a general health regimen, and also for a variety of health conditions.
- Acupuncture is a family of procedures involving the stimulation of specific points on the body using a variety of techniques, such as penetrating the skin with needles that are then manipulated by hand or by electrical stimulation. It is one of the key components of traditional Chinese medicine, and is among the oldest healing practices in the world.

Other examples of mind and body practices include **deep-breathing exercises, guided imagery, hypnotherapy, progressive relaxation, qi gong, and tai chi**.

Historical note: The concept that the mind is important in the treatment of illness is

integral to the healing approaches of traditional Chinese medicine and Ayurvedic medicine, dating back more than 2,000 years. Hippocrates also noted the moral and spiritual aspects of healing and believed that treatment could occur only with consideration of attitude, environmental influences, and natural remedies.

Current use: Several mind and body approaches ranked among the top 10 CAM practices reported by adults in the 2007 NHIS. For example, the survey found that 12.7 percent of adults had used deep-breathing exercises, 9.4 percent had practiced meditation, and 6.1 percent had practiced yoga; use of these three CAM practices had increased significantly since the previous (2002) NHIS. Progressive relaxation and guided imagery were also among the top 10 CAM therapies for adults; deep breathing and yoga ranked high among children. Acupuncture had been used by 1.4 percent of adults and 0.2 percent of children. Acupuncture is considered to be a part of mind and body medicine, but it is also a component of energy medicine, manipulative and body-based practices, and traditional Chinese medicine.

Manipulative and Body-Based Practices

Manipulative and body-based practices focus primarily on the structures and systems of the body, including the bones and joints, soft tissues, and circulatory and lymphatic systems. Two commonly used therapies fall within this category:

- Spinal manipulation is performed by chiropractors and by other health care professionals such as physical therapists, osteopathic physicians, and some conventional medical doctors. Practitioners use their hands or a device to apply a controlled force to a joint of the spine, moving it beyond its passive range of motion; the amount of force applied depends on the form of manipulation used. Spinal manipulation is among the treatment options used by people with low-back pain - a very common condition that can be difficult to treat.
- The term massage therapy encompasses many different techniques. In general, therapists press, rub, and otherwise manipulate the muscles and other soft tissues of the body. People use massage for a variety of health-related purposes, including to relieve pain, rehabilitate sports injuries, reduce stress, increase relaxation, address anxiety and depression, and aid general well-being.

Other CAM Practices

CAM also encompasses **movement therapies**—a broad range of Eastern and Western movement-based approaches used to promote physical, mental, emotional, and spiritual well-being. Examples include Feldenkrais method, Alexander technique, Pilates, Rolfing Structural Integration, and Trager psychophysical integration. According to the 2007 NHIS, 1.5 percent of adults and 0.4 percent of children used movement therapies.

Practices of traditional healers can also be considered a form of CAM. Traditional healers use methods based on indigenous theories, beliefs, and experiences handed down from generation to generation. A familiar example in the United States is the Native American healer/medicine man. The 2007 NHIS found that 0.4 percent of adults and 1.1 percent of children had used a traditional healer (usage varied for the seven specific types of healers identified in the survey).

Some CAM practices involve manipulation of various energy fields to affect health. Such fields may be characterized as veritable (measurable) or putative (yet to be measured). Practices based on veritable forms of energy include those involving electromagnetic fields (e.g., magnet therapy and light therapy). Practices based on putative energy fields (also called biofields) generally reflect the concept that human beings are infused with subtle forms of energy; qi gong, Reiki, and healing touch are examples of such practices. The 2007 NHIS found relatively low use of putative energy therapies. Only 0.5 percent of adults and 0.2 percent of children had used energy healing/Reiki (the survey defined energy healing as the channeling of healing energy through the hands of a practitioner into the client's body).

Finally, whole medical systems, which are complete systems of theory and practice that have evolved over time in different cultures and apart from conventional or Western medicine, may be considered CAM. Examples of ancient whole medical systems include Ayurvedic medicine and traditional Chinese medicine. More modern systems that have developed in the past few centuries include homeopathy and naturopathy. The 2007 NHIS asked about the use of Ayurveda, homeopathy, and naturopathy. Although relatively few respondents said they had used Ayurveda or naturopathy, homeopathy ranked 10th in usage among adults (1.8 percent) and 5th among children (1.3 percent).

Health Fraud

You have probably seen ads for miracle cures - a supplement to cure cancer, a diet to cure diabetes. But remember - if it sounds too good to be true, then it probably is. Health fraud involves selling drugs, devices, foods or cosmetics that have not been proven effective. At best, these scams don't work. At worst, they're dangerous. They also waste money, and they might keep you from getting the treatment you really need. Health scams often target older people. Most victims in the United States are older than 65.

To protect yourself -

- Question claims of miracle cures or breakthroughs
- Know that newspapers, magazines, and radio and TV stations do not have to make sure that the ads they run are true
- Find out about products before you buy them
- Don't let salespeople force you into making snap decisions
- Check with your doctor before taking products

Beware of Health Scams

You see the ads everywhere these days — "Smart Drugs" for long life or "Arthritis Aches and Pains Disappear Like Magic!" or even statements claiming, "This treatment cured my cancer in 1 week." It's easy to understand the appeal of these promises. But there is still plenty of truth to the old saying, "If it sounds too good to be true, it probably is!"

Health scams and the marketing of unproven cures have been around for many years. Today, there are more ways than ever to sell these untested products. In addition to TV,

radio, magazines, newspapers, infomercials, mail, telemarketing, and even word-of-mouth, these products are now offered over the Internet—with websites describing miracle cures and emails telling stories of overnight magic. Sadly, older people are often the target of such scams.

The problem is serious. Untested remedies may be harmful. They may get in the way of medicines prescribed by your doctor. They may also waste money. And, sometimes, using these products keeps people from getting the medical treatment they need.

False Hopes

Why do people fall for these sales pitches? Unproven remedies promise false hope. They offer cures that appear to be painless or quick. At best, these treatments are worthless. At worst, they are dangerous. Health scams prey on people who are frightened or in pain. Living with a chronic health problem is hard. It's easy to see why people might fall for a false promise of a quick and painless cure. The best way for scientists to find out if a treatment works is through a clinical trial.

These scams usually target diseases that have no cures, like diabetes, arthritis, and Alzheimer's disease.

How Can You Protect Yourself From Health Scams?

Be wary. Question what you see or hear in ads or on the Internet. Newspapers, magazines, radio, and TV stations do not always check to make sure the claims in their ads are true. Find out about a product before you buy. Don't let a salesperson talk you into making a snap decision. Check with your healthcare provider first.

- Promise a quick or painless cure
- Claim the product is made from a special, secret, or ancient formula
- Offer products and services only by mail or from one company
- Use statements or unproven case histories from so-called satisfied patients
- Claim to be a cure for a wide range of ailments
- Claim to cure a disease (such as arthritis or Alzheimer's disease) that hasn't been cured by medical science
- Promise a no-risk, money-back guarantee
- Offer an additional "free" gift or a larger amount of the product as a "special promotion"
- Require advance payment and claim there is a limited supply of the product

Section 14.7 Health Disparity

Despite prevention efforts, some groups of people are affected by HIV/AIDS, viral hepatitis, STI's, and TB, more than other groups of people. The occurrence of these diseases at greater levels among certain population groups more than among others is often referred to as a health disparity. Differences may occur by gender, race or ethnicity, education, income, disability, geographic location and sexual orientation among others. Social determinants of health like poverty, unequal access to health care, lack of education,

stigma, and racism are linked to health disparities.

Health in the United States is a complex and often contradictory issue. On the one hand, as one of the wealthiest nations, the United States fares well in health comparisons with the rest of the world. However, the United States also lags behind almost every industrialized country in terms of providing care to all its citizens. The following sections look at different aspects of health in America.

Health by Race and Ethnicity

When looking at the social epidemiology of the United States, it is hard to miss the disparities among races. The discrepancy between African Americans and white Americans shows the gap clearly; in 2008, the average life expectancy for white males was approximately five years longer than for African American males: 75.9 compared to 70.9. An even stronger disparity was found in 2007: the infant mortality rate for African Americans was nearly twice that of white Americans at 13.2 compared to 5.6 per 1,000 live births (U.S. Census Bureau 2011). According to a report from the Henry J. Kaiser Foundation (2007), African Americans also have higher incidence of several other diseases and causes of mortality, from cancer to heart disease to diabetes. In a similar vein, it is important to note that ethnic minorities, including Mexican Americans and Native Americans, also have higher rates of these diseases and causes of mortality than whites. Lisa Berkman (2009) notes that this gap started to narrow during the Civil Rights movement in the 1960s, but it began widening again in the early 1980s.

What accounts for these perpetual disparities in health among different ethnic groups? Much of the answer lies in the level of health care that these groups receive. The National Healthcare Disparities Report (2010) shows that even after adjusting for insurance differences, racial and ethnic minority groups receive poorer quality of care and less access to care than dominant groups. The Report identified these racial inequalities in care: Black Americans, American Indians, and Alaskan Natives received inferior care than Caucasian Americans for about 40 percent of measures Asian ethnicities received inferior care for about 20 percent of measures Among whites, Hispanic whites received 60 percent inferior care of measures compared to non-Hispanic whites (Agency for Health Research and Quality 2010). When considering access to care, the figures were comparable.

Health by Socioeconomic Status

Discussions of health by race and ethnicity often overlap with discussions of health by socioeconomic status, since the two concepts are intertwined in the United States. As the Agency for Health Research and Quality (2010) notes, “racial and ethnic minorities are more likely than non-Hispanic whites to be poor or near poor,” so many of the data pertaining to subordinate groups is also likely to be pertinent to low socioeconomic groups. Marilyn Winkleby and her research associates (1992) state that “one of the strongest and most consistent predictors of a person’s morbidity and mortality experience is that person’s socioeconomic status (SES). This finding persists across all diseases with few exceptions, continues throughout the entire lifespan, and extends across numerous risk

factors for disease." It is important to remember that economics are only part of the SES picture; research suggests that education also plays an important role. Phelan and Link (2003) note that many behavior-influenced diseases like lung cancer (from smoking), coronary artery disease (from poor eating and exercise habits), and AIDS initially were widespread across SES groups. However, once information linking habits to disease was disseminated, these diseases decreased in high SES groups and increased in low SES groups. This illustrates the important role of education initiatives regarding a given disease, as well as possible inequalities in how those initiatives effectively reach different SES groups.

Health by Gender

Women are affected adversely both by unequal access to and institutionalized sexism in the health care industry. According a recent report from the Kaiser Family Foundation, women experienced a decline in their ability to see needed specialists between 2001 and 2008. In 2008, one quarter of females questioned the quality of her health care (Ranji and Salganico 2011). In this report, we also see the explanatory value of intersection theory. Feminist sociologist Patricia Hill Collins developed this theory, which suggests we cannot separate the effects of race, class, gender, sexual orientation, and other attributes. Further examination of the lack of confidence in the health care system by women, as identified in the Kaiser study, found, for example, women categorized as low income were more likely (32 percent compared to 23 percent) to express concerns about health care quality, illustrating the multiple layers of disadvantage caused by race and sex.

We can see an example of institutionalized sexism in the way that women are more likely than men to be diagnosed with certain kinds of mental disorders. Psychologist Dana Becker notes that 75 percent of all diagnoses of Borderline Personality Disorder (BPD) are for women according to the Diagnostic Statistical Manual of Mental Disorders. This diagnosis is characterized by instability of identity, of mood, and of behavior, and Becker argues that it has been used as a catch-all diagnosis for too many women. She further decries the pejorative connotation of the diagnosis, saying that it predisposes many people, both within and outside of the profession of psychotherapy, against women who have been so diagnosed (Becker).

Many critics also point to the medicalization of women's issues as an example of institutionalized sexism. Medicalization refers to the process by which previously normal aspects of life are redefined as deviant and needing medical attention to remedy. Historically and contemporaneously, many aspects of women's lives have been medicalized, including menstruation, pre-menstrual syndrome, pregnancy, childbirth, and menopause.

The medicalization of pregnancy and childbirth has been particularly contentious in recent decades, with many women opting against the medical process and choosing a more natural childbirth. Fox and Worts (1999) find that all women experience pain and anxiety during the birth process, but that social support relieves both as effectively as medical support. In other words, medical interventions are no more effective than social ones at helping with the difficulties of pain and childbirth. Fox and Worts further found that

women with supportive partners ended up with less medical intervention and fewer cases of postpartum depression. Of course, access to quality birth care outside of the standard medical models may not be readily available to women of all social classes.

Summary

Despite generally good health in the U.S. compared with less-developed countries, America is still facing challenging issues such as a prevalence of obesity and diabetes. Moreover, Americans of historically disadvantaged racial groups, ethnicities, socioeconomic status, and gender experience lower levels of health care. Mental health and disability are health issues that are significantly impacted by social norms.

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