ADVANCED HUMAN NUTRITION



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Advanced Human Nutrition

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Licensing

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Ackowledgements

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CHAPTER OVERVIEW

1: Nutrition Science and Information Literacy

Learning Objectives

After completing this unit, you should be able to:

1. Identify the sequential steps of the scientific method, and understand the importance of reporting research results in peer-reviewed journals.
2. Describe the different types of research studies used in nutrition, including the quality of evidence, advantages, and limitations of each.
3. Be aware of some of the limitations of nutrition research, including the challenges of studying complex dietary patterns and the influence of industry funding.
4. Understand differences between scholarly (peer-reviewed) and popular sources for nutrition information.
5. Evaluate sources of nutrition information and distinguish between credible sources and junk science.
6. Identify the qualifications of nutrition professionals and career opportunities in the field of nutrition.

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1.1: Introduction to Nutrition Science and Information Literacy

If you follow nutrition science in the media for long enough, you'll start to see recurring themes. You'll see stories in the news about many of our favorite foods—like eggs, butter, coffee, and chocolate—that seem to flip-flop about whether these foods are good or bad for us. You'll notice seemingly eternal debates about whether dietary fat and carbohydrates are valuable macronutrients or villians. You'll watch as particular diets come in and out of fashion—and then back into fashion another decade or two later. And you'll see countless click-baity stories about the health benefits of eating so-called superfoods, or the dangers of eating others.



Figure 1.1.1: Photo by Brooke Cagle on Unsplash (license information)

Even if you don't pay much attention to nutrition science in the news, you'll hear a ton of conflicting opinions and information just by talking to the people around you. Maybe your best friend has gone gluten-free, your dad is on a keto diet, and your coworker swears the Whole 30 diet has been life-changing. They're all trying to convince you to join them in their latest diets, but your head is swimming. They can't all be right, and you don't want to just follow the latest fad. You want to find accurate information that's based on solid scientific evidence. How can you identify it in a sea of conflicting and overwhelming information? Who can you trust?

It can be hard to filter through it all, especially when it's attached to strong opinions, emotions, and people trying to sell their product or point-of-view. And yet, we all need to make choices about what to eat, at the very least for ourselves, and often for others. You may have the responsibility of feeding family members in different stages of life, with different needs and preferences. And if you work in the health professions, you may have patients or clients who look to you as a source of reliable information about nutrition. Of course, the problem of conflicting and overwhelming information is not unique to nutrition; you'll find the same issue in many other health-related fields, and beyond.

Now, more than ever, it's essential to develop skills in information literacy, including the ability to find information, evaluate whether it is accurate and useful, and apply it effectively. The purpose of this unit is to develop and hone your skills in information literacy as it applies to nutrition. You'll learn about the scientific method, because it forms the foundation of how we know what we know about nutrition. You'll learn about the different types of research studies and each of their advantages and limitations. We'll discuss various sources of information, such as scholarly and popular sources, how each of them can be useful in different ways, and how to evaluate them. We'll also discuss careers in nutrition and the different types of skills that you'll find among nutrition experts.

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1.2: The Scientific Method

Similar to the method by which a police detective investigates a crime, nutritional scientists discover the health effects of food and nutrients by first making an observation and posing a question that they'd like to answer. Then they formulate a hypothesis, test their hypothesis through experiments, and finally interpret the results. After analyzing additional evidence from multiple sources, they may form a conclusion on whether the food suspect fits the claim. This organized process of inquiry used in forensic science, nutritional science, and every other science is called the ***scientific method***.

The basis of what we know about nutrition is derived from research, and the scientific method underlies how research is conducted. The steps of the scientific method include:

1. **Observation/Question:** The researcher first makes an observation and comes up with a research question to investigate.

2. **Hypothesis:** The researcher formulates a hypothesis or educated guess, that would explain the observation or question and that can be tested through scientific experiments.

3. **Experiment:** The researcher designs experiment. A good design takes into account what has been done previously. Thus, before beginning a new study, the researcher undertakes a thorough review of published research in order to ensure that their work advances the field.

4. **Perform:** Perform the experiment/research and collect results or data.

4. **Analysis:** The researcher collects and analyzes data that will either support or refute the hypothesis. If the hypothesis is not supported, researchers create a new hypothesis and conduct a new experiment. If the hypothesis is supported, researchers will design additional experiments to try to replicate the findings or to test them in different ways.

5. **Conclusion:** After multiple experiments consistently support a hypothesis, researchers can offer a conclusion or theory.

6. **Communicate Findings:** Ultimately, researchers hope to publish their research in peer-reviewed journals. They may publish their findings in abstract, thesis/dissertation, or pamplet/newsletter/blog. These are not considered peer-reviewed.



Figure 1.1. The scientific method is a cyclical process because it always leads to new observations and questions.

Through the scientific method, our knowledge of science builds continuously over time. No one study is enough to fully explain any one phenomenon, particularly in an area as complex as nutrition. Even experiments that go exactly as expected lead us to new questions to investigate. Science is also filled with surprises, both big and small. Experiments may not yield the results that we expect, but that can lead to new and important questions. And because scientists are human, they can make mistakes along the way or fail to acknowledge or test an important variable, which is why it's important that experiments be repeated and evaluated by other researchers along the way.

The history of nutrition is full of fascinating examples of the scientific method at work, such as the discovery that iodine is a nutrient. This story of scientific discovery began in 1811, when French chemist Bernard Courtois was isolating a substance called saltpeter, an ingredient needed to make gunpowder to be used by Napoleon's army. Part of his isolation procedure involved burning seaweed. When he did this, he **observed** the release of an intense violet vapor, which crystallized when he exposed it to a cold surface. He sent the violet crystals to an expert on gases, Joseph Gay-Lussac, who identified the crystal as a new element. It was named iodine, the Greek word for violet. The following scientific record is some of what took place in order to conclude that iodine is a nutrient.[1,2]

Observation: Eating seaweed is a cure for goiter, an enlargement of the thyroid gland in the neck.

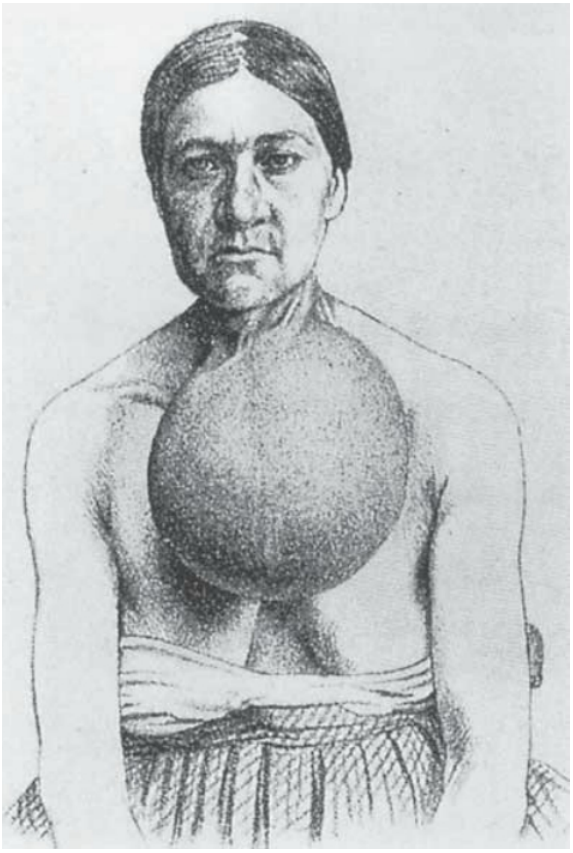


Figure 1.2. *Large goiter in a woman from Bern, Switzerland.*

Hypothesis: In 1813, Swiss physician Jean-Francois Coindet hypothesized that seaweed contained iodine and that he could use iodine instead of seaweed to treat his patients.

Experimental test: Coindet administered iodine tincture orally to his patients with goiter.

Interpret results: Coindet's iodine treatment was successful in treating patients with goiter.

Gathering more evidence: Many other physicians contributed to the research on iodine deficiency and goiter.

Hypothesis: In 1851, French chemist Chatin proposed that the low iodine content in food and water of certain areas far away from the ocean were the primary cause of goiter and renounced the theory that goiter was the result of poor hygiene. (Physicians at the time also blamed drunkenness, dampness, and contaminated water as causes of goiter.)

Experimental test: In the late 1860s, authorities in several French villages began giving out iodine tablets and salt in an effort to treat goiter.

Interpret results: The program was effective, and 80 percent of goitrous children were cured. However, adults did not always respond well to the treatment, and because men with goiter were exempted from service in the French military, some people were opposed to treating it. Some scientists also insisted that goiter was caused by infectious disease, so iodine wasn't yet accepted as a means of preventing it.

Hypothesis: In 1918, Swiss doctor Bayard proposed iodizing salt as a good way to treat areas endemic with goiter.

Experimental test: Iodized salt was transported by mules to a small village at the base of the Matterhorn, where more than 75 percent of school children were goitrous. It was given to families to use for six months.

Results: The iodized salt was beneficial in treating goiter in this remote population.

Experimental test: Physician David Marine conducted the first U.S. experiment of treating goiter with iodized salt in Akron, Ohio.

Results: This study conducted on over 4,000 school children found that iodized salt prevented goiter.

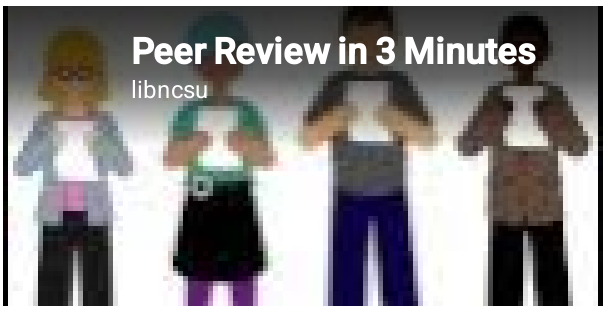
Conclusions: Seven other studies similar to Marine's were conducted in Italy and Switzerland that also demonstrated the effectiveness of iodized salt in treating goiter. In 1924, U.S. public health officials initiated the program of iodizing salt and started eliminating the scourge of goiterism. Today, more than 70 percent of American households use iodized salt, and many other countries have followed the same public health strategy to reduce the health consequences of iodine deficiency.

It took more than one hundred years from iodine's discovery as an effective treatment for goiter until public health programs recognized it as such. Although a lengthy process, the scientific method is a productive way to define essential nutrients and determine their ability to promote health and prevent disease.

Reporting Scientific Work

As we saw with the story of iodine research, scientists must share their findings in order for other researchers to expand and build upon their discoveries. Collaboration with other scientists, when planning and conducting studies and analyzing results, is important for scientific research. For this reason, communicating with peers and disseminating study results are important aspects of a scientist's work. Scientists can share results by presenting them at a scientific meeting or conference, but this approach can reach only the select few who are present. Instead, **most scientists present their results in peer-reviewed manuscripts that are published in scientific journals**.

Peer-reviewed manuscripts are scientific papers that are reviewed by a scientist's colleagues, or peers. These colleagues are qualified individuals, often experts in the same research area, who judge whether or not the scientist's work is suitable for publication. The process of peer review is a quality control step; its goal is to ensure that the research described in a scientific paper is original, significant, logical, and thorough. It's important to note that peer review doesn't mean a study is perfect or even good. Sometimes bad studies slip through peer review, but because they're published and other scientists read them, these are usually caught later and often retracted. Science is often messy and imperfect, but peer-review and publication of results are essential to its progress and ability to self-correct when people make mistakes.





VIDEO: “Peer Review in 3 Minutes” by libncsu, YouTube (May 1, 2014), 3:14 minutes.

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References:

[1]Carpenter, K. J. (2005). David Marine and the Problem of Goiter. *The Journal of Nutrition*, *135*(4), 675–680. https://doi.org/10.1093/jn/135.4.675

[2]Zimmermann, M. B. (2008). Research on Iodine Deficiency and Goiter in the 19th and Early 20th Centuries. *The Journal of Nutrition*, *138*(11), 2060–2063. https://doi.org/10.1093/jn/138.11.2060

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1.3: Types of Research Studies and How To Interpret Them

The field of nutrition is dynamic, and our understanding and practices are always evolving. Nutrition scientists are continuously conducting new research and publishing their findings in peer-reviewed journals. This adds to scientific knowledge, but it's also of great interest to the public, so nutrition research often shows up in the news and other media sources. You might be interested in nutrition research to inform your own eating habits, or if you work in a health profession, so that you can give evidence-based advice to others. Making sense of science requires that you understand the types of research studies used and their limitations.

The Hierarchy of Nutrition Evidence

Researchers use many different types of study designs depending on the question they are trying to answer, as well as factors such as time, funding, and ethical considerations. The study design affects how we interpret the results and the strength of the evidence as it relates to real-life nutrition decisions. It can be helpful to think about the types of studies within a pyramid representing a hierarchy of evidence, where **the studies at the bottom of the pyramid usually give us the weakest evidence with the least relevance to real-life nutrition decisions, and the studies at the top offer the strongest evidence, with the most relevance to real-life nutrition decisions.**

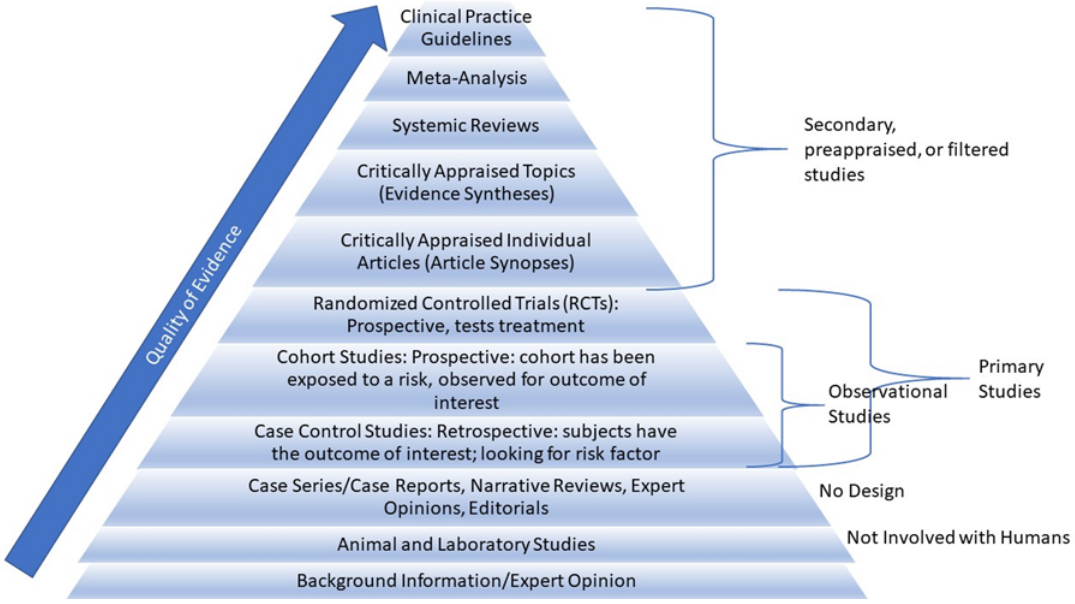


Figure 2.1. Hierarchy of research design and levels of scientific evidence with the strongest studies at the top and the weakest at the bottom.

The pyramid also represents a few other general ideas. There tend to be more studies published using the methods at the bottom of the pyramid, because they require less time, money, and other resources. **When researchers want to test a new hypothesis, they often start with the study designs at the bottom of the pyramid**, such as in vitro, animal, or observational studies. Intervention studies are more expensive and resource-intensive, so there are fewer of these types of studies conducted. But they also give us higher quality evidence, so they're an important next step if observational and non-human studies have shown promising results. Meta-analyses and systematic reviews combine the results of many studies already conducted, so they help researchers summarize scientific knowledge on a topic.

Non-Human Studies: In Vitro & Animal Studies

The simplest form of nutrition research is an ***in vitro study***. In vitro means "within glass," (although plastic is used more commonly today) and these experiments are conducted within flasks, dishes, plates, and test tubes. One common form of *in vitro* research is cell culture. This involves growing cells in flasks and dishes. In order for cells to grow, they need a nutrient source. For cell culture, the nutrient source is referred to as media. Media supplies nutrients to the cells in vitro similarly to how blood performs this function within the body. Most cells adhere to the bottom of the flask and are so small that a microscope is needed to see them. The

cells are grown inside an incubator, which is a device that provides the optimal temperature, humidity, and carbon dioxide (CO_2) concentrations for cells and microorganisms. By imitating the body's temperature and CO_2 levels (37 degrees Celsius, 5% CO_2), the incubator allows cells to grow even though they are outside the body.

A limitation of *in vitro* research compared to in vivo research is that it typically does not take digestion or bioavailability into account. This means that the concentration used might not be physiologically possible (it might be much higher) and that digestion and metabolism of what is being provided to cells may not be taken into account. Cell-based in vitro research is not as complex of a biological system as animals or people that have tissues, organs, etc. working together as well.

Since these studies are performed on isolated cells or tissue samples, they are less expensive and time-intensive than animal or human studies. *In vitro* studies are vital for zooming in on biological mechanisms, to see how things work at the cellular or molecular level. However, these studies shouldn't be used to draw conclusions about how things work in humans (or even animals), because we can't assume that the results will apply to a whole, living organism.



Animal studies are one form of ***in vivo*** research, which translates to "within the living." Rats and mice are the most common animals used in nutrition research. Animals are often used in research that would be unethical to conduct in humans. Another advantage of animal dietary studies is that researchers can control exactly what the animals eat. In human studies, researchers can tell subjects what to eat and even provide them with the food, but they may not stick to the planned diet. People are also not very good at estimating, recording, or reporting what they eat and in what quantities. In addition, animal studies typically do not cost as much as human studies.

There are some important limitations of animal research. First, an animal's metabolism and physiology are different from humans. Plus, animal models of disease (cancer, cardiovascular disease, etc.), although similar, are different from human diseases. Animal research is considered preliminary, and while it can be very important to the process of building scientific understanding and informing the types of studies that should be conducted in humans, animal studies shouldn't be considered relevant to real-life decisions about how people eat.

Observational Studies

Observational studies in human nutrition collect information on people's dietary patterns or nutrient intake and look for associations with health outcomes. Observational studies do not give participants a treatment or intervention; instead, they look at what they're already doing and see how it relates to their health. These types of study designs can only identify ***correlations*** (relationships) between nutrition and health; they can't show that one factor *causes* another. (For that, we need intervention studies, which we'll discuss in a moment.) Observational studies that describe factors correlated with human health are also called ***epidemiological studies***.[1]

Epidemiology is defined as the study of human populations. These studies often investigate the relationship between dietary consumption and disease development. There are three main types of epidemiological studies: cross-sectional, case-control, and prospective cohort studies.

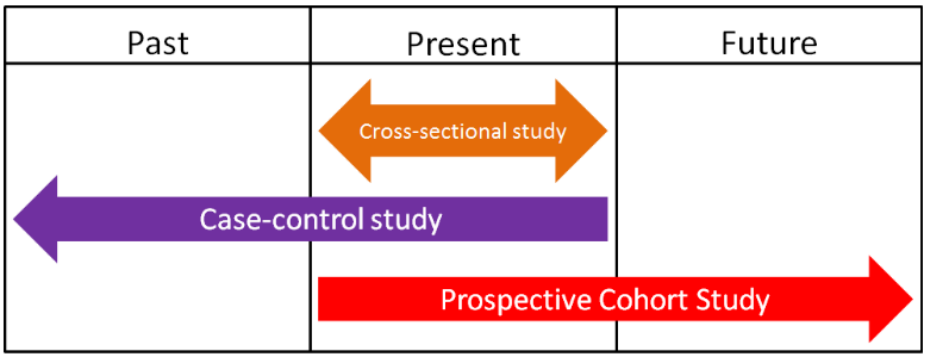


Figure 2.2: Types of epidemiology. Adapted from reference 6.

One example of a nutrition hypothesis that has been investigated using observational studies is that eating a Mediterranean diet reduces the risk of developing cardiovascular disease. (A Mediterranean diet focuses on whole grains, fruits and vegetables, beans and other legumes, nuts, olive oil, herbs, and spices. It includes small amounts of animal protein (mostly fish), dairy, and red wine.[2]) There are three main types of observational studies, all of which could be used to test hypotheses about the Mediterranean diet:

- ***Cohort studies*** follow a group of people (a cohort) over time, measuring factors such as diet and health outcomes. A cohort study of the Mediterranean diet would ask a group of people to describe their diet, and then researchers would track them over time to see if those eating a Mediterranean diet had a lower incidence of cardiovascular disease.
- ***Case-control studies*** compare a group of cases and controls, looking for differences between the two groups that might explain their different health outcomes. For example, researchers might compare a group of people with cardiovascular disease with a group of healthy controls to see whether there were more controls or cases that followed a Mediterranean diet.
- ***Cross-sectional studies*** collect information about a population of people at one point in time. For example, a cross-sectional study might compare the dietary patterns of people from different countries to see if diet correlates with the prevalence of cardiovascular disease in the different countries.

There are two types of cohort studies: retrospective and prospective. ***Retrospective*** studies look at what happened in the past, and they're considered weaker because they rely on people's memory of what they ate or how they felt in the past. ***Prospective*** cohort studies, which enroll a cohort and follow them into the future, are usually considered the strongest type of observational study design.

Most cohort studies are prospective. Initial information is collected (usually by food frequency questionnaires) on the intake of a cohort of people at baseline, or the beginning. This cohort is then followed over time (normally many years) to quantify health outcomes of the individual within it. Cohort studies are normally considered to be more robust than case-control studies, because these studies do not start with diseased people and normally do not require people to remember their dietary habits in the distant past or before they developed a disease. An example of a prospective cohort study would be if you filled out a questionnaire on your current dietary habits and are then followed into the future to see if you develop osteoporosis. As shown below, instead of separating based on disease versus disease-free, individuals are separated based on exposure. In this example, those who are exposed are more likely to be diseased than those who were not exposed.

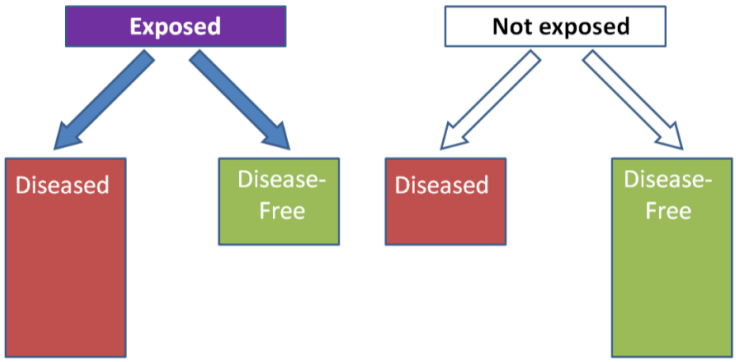


Figure 2.3: An example of a cohort study in which those exposed are more likely to develop the disease3

Using trans-fat intake again as the exposure and cardiovascular disease as the disease, the figure would be expected to look like this:

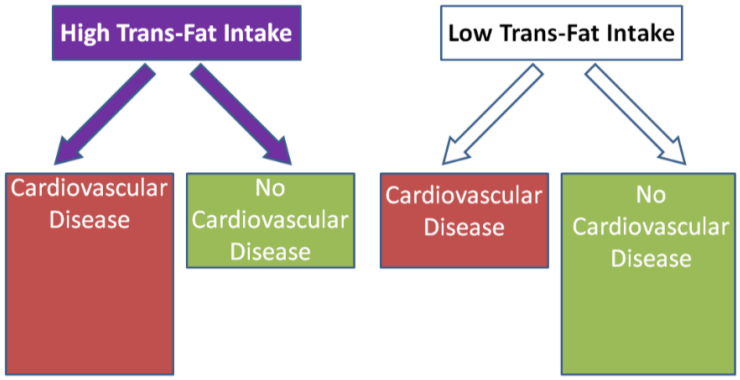


Figure 2.4: An example of a cohort study where higher trans-fat intake is associated with a higher incidence of cardiovascular disease3

There are several well-known examples of ***prospective*** cohort studies that have described important correlations between diet and disease:

- **Framingham Heart Study:** Beginning in 1948, this study has followed the residents of Framingham, Massachusetts to identify risk factors for heart disease.
- **Health Professionals Follow-Up Study:** This study started in 1986 and enrolled 51,529 male health professionals (dentists, pharmacists, optometrists, osteopathic physicians, podiatrists, and veterinarians), who complete diet questionnaires every 2 years.
- **Nurses Health Studies:** Beginning in 1976, these studies have enrolled three large cohorts of nurses with a total of 280,000 participants. Participants have completed detailed questionnaires about diet, other lifestyle factors (smoking and exercise, for example), and health outcomes.

Observational studies have the advantage of allowing researchers to study large groups of people in the real world, looking at the frequency and pattern of health outcomes and identifying factors that correlate with them. But even very large observational studies may not apply to the population as a whole. For example, the Health Professionals Follow-Up Study and the Nurses Health Studies include people with above-average knowledge of health. In many ways, this makes them ideal study subjects, because they may be more motivated to be part of the study and to fill out detailed questionnaires for years. However, the findings of these studies may not apply to people with less baseline knowledge of health.

We've already mentioned another important limitation of observational studies—that they can only determine correlation, not causation. A prospective cohort study that finds that people eating a Mediterranean diet have a lower incidence of heart disease can only show that the Mediterranean diet is *correlated* with lowered risk of heart disease. It can't show that the Mediterranean diet directly prevents heart disease. Why? There are a huge number of factors that determine health outcomes such as heart disease, and other factors might explain a correlation found in an observational study. For example, people who eat a Mediterranean diet might also be the same kind of people who exercise more, sleep more, have a higher income (fish and nuts can be expensive!), or be less stressed. These are called ***confounding factors***; they're factors that can affect the outcome in question (i.e., heart disease) and also vary with the factor being studied (i.e., Mediterranean diet).

Intervention Studies

***Intervention studies*, also sometimes called experimental studies or clinical trials, include some type of treatment or change imposed by the researcher.** Examples of interventions in nutrition research include asking participants to change their diet, take a supplement, or change the time of day that they eat. Unlike observational studies, **intervention studies can provide evidence of cause and effect**, so they are higher in the hierarchy of evidence pyramid.

Randomization: The gold standard for intervention studies is the ***randomized controlled trial (RCT).*** In an RCT, study subjects are recruited to participate in the study. They are then **randomly assigned** into one of at least two groups, one of which is a control group (this is what makes the study **controlled**).

Randomization is the process of randomly assigning subjects to groups to decrease bias. Bias is a systematic error that may influence results. Bias can occur in assigning subjects to groups in a way that will influence the results. An example of bias in a

study of an antidepressant drug is shown below. In this nonrandomized antidepressant drug example, researchers (who know what the subjects are receiving) put depressed subjects into the placebo group, while "less depressed" subjects are put into the antidepressant drug group. As a result, even if the drug isn't effective, the group assignment may make the drug appear effective, thus biasing the results as shown below.

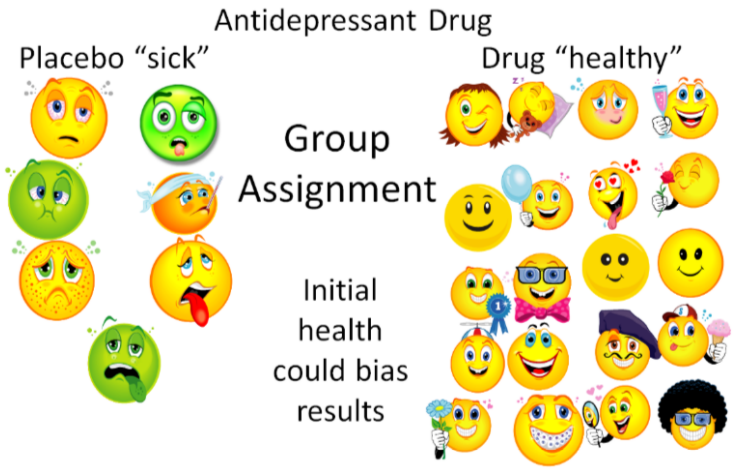


Figure 2.5: Non-randomized antidepressant drug example

This is a bit of an extreme example, but even if the researchers are trying to prevent bias, sometimes bias can still occur. However, if the subjects are randomized, the sick and the healthy people will ideally be equally distributed between the groups. Thus, the trial will be unbiased and a true test of whether or not the drug is effective.

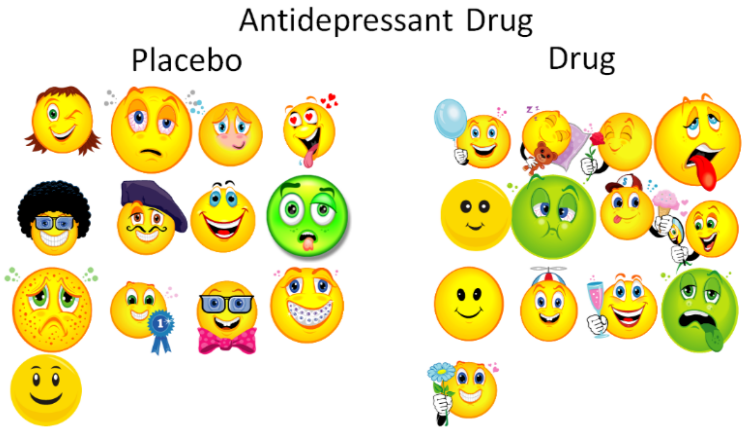


Figure 2.6: Randomized antidepressant drug example

Here is another example. In an RCT to study the effects of the Mediterranean diet on cardiovascular disease development, researchers might ask the control group to follow a low-fat diet (typically recommended for heart disease prevention) and the intervention group to eat a Mediterranean diet. The study would continue for a defined period of time (usually years to study an outcome like heart disease), at which point the researchers would analyze their data to see if more people in the control or Mediterranean diet had heart attacks or strokes. Because the treatment and control groups were randomly assigned, they should be alike in every other way except for diet, so differences in heart disease could be attributed to the diet. This eliminates the problem of confounding factors found in observational research, and it’s why RCTs can provide evidence of causation, not just correlation.

Imagine for a moment what would happen if the two groups weren’t randomly assigned. What if the researchers let study participants choose which diet they’d like to adopt for the study? They might, for whatever reason, end up with more overweight people who smoke and have high blood pressure in the low-fat diet group, and more people who exercised regularly and had already been eating lots of olive oil and nuts for years in the Mediterranean diet group. If they found that the Mediterranean diet group had fewer heart attacks by the end of the study, they would have no way of knowing if this was because of the diet or because of the underlying differences in the groups. In other words, without randomization, their results would be compromised by confounding factors, with many of the same limitations as observational studies.

Placebo: In an RCT of a supplement, the control group would receive a ***placebo—a* "fake" treatment that contains no active ingredients, such as a sugar pill.** The use of a placebo is necessary in medical research because of a phenomenon known as the placebo effect. The ***placebo effect*** results in a beneficial effect because of a subject's *belief* in the treatment, even though there is no treatment actually being administered. An example would be an athlete who consumes a sports drink and runs the 100-meter dash in 11.00 seconds. The athlete then, under the exact same conditions, drinks what he is told is "Super Duper Sports Drink" and runs the 100-meter dash in 10.50 seconds. But what the athlete didn't know was that Super Duper Sports Drink was the Sports Drink + Food Coloring. There was nothing different between the drinks, but the athlete believed that the "Super Duper Sports Drink" was going to help him run faster, so he did. This improvement is due to the placebo effect.

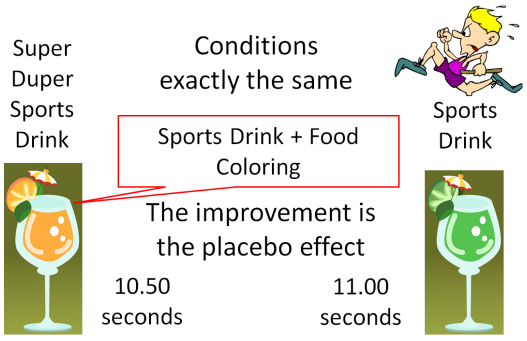


Figure 2.7. An example of the placebo effect

Blinding is a technique to prevent bias in intervention studies. In a study without blinding, the subject and the researchers both know what treatment the subject is receiving. This can lead to bias if the subject or researcher has expectations about the treatment working, so these types of trials are used less frequently. It's best if a study is ***double-blind*, meaning that neither the researcher nor the subject knows what treatment the subject is receiving.** It's relatively simple to double-blind a study where subjects are receiving a placebo or treatment pill because they could be formulated to look and taste the same. In a ***single-blind study***, either the researcher or the subject knows what treatment they're receiving, but not both. Studies of diets—such as the Mediterranean diet example—often can't be double-blinded because the study subjects know whether or not they're eating a lot of olive oil and nuts. However, the researchers who are checking participants' blood pressure or evaluating their medical records could be blinded to their treatment group, reducing the chance of bias.

Open-label study:

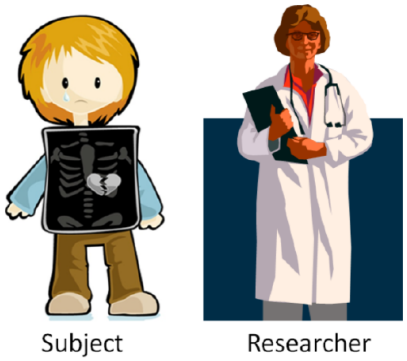


Figure 2.8: In an open-label study, both the subject and researcher know what treatment the subject is receiving.

Single-blinded study:

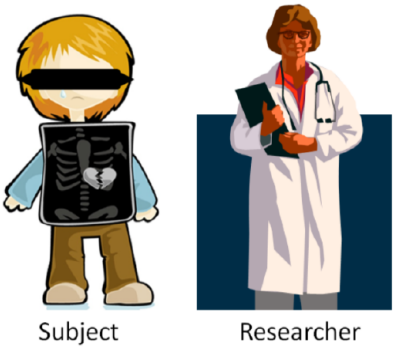


Figure 2.9: In a single-blind study, the researcher knows what treatment the subject is receiving, but the subject does not.

Double-blinded study:

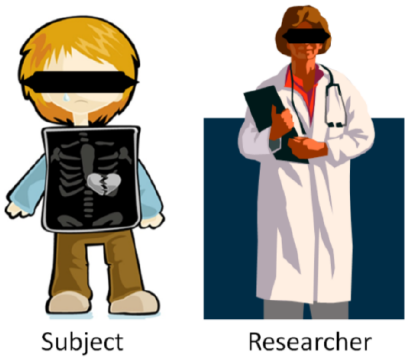
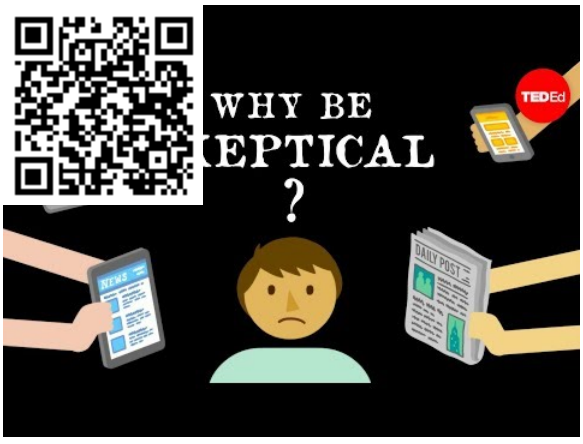


Figure 2.19: In a double-blind study, neither the subject nor the researcher knows what treatment the subject is receiving.

Like all studies, RCTs and other intervention studies do have some limitations. They can be difficult to carry on for long periods of time and require that participants remain compliant with the intervention. They're also costly and often have smaller sample sizes. Furthermore, it is unethical to study certain interventions. (An example of an unethical intervention would be to advise one group of pregnant mothers to drink alcohol to determine its effects on pregnancy outcomes because we know that alcohol consumption during pregnancy damages the developing fetus.)





VIDEO: "Not all scientific studies are created equal" by David H. Schwartz, YouTube (April 28, 2014), 4:26.

Meta-Analyses and Systematic Reviews

At the top of the hierarchy of evidence pyramid are systematic reviews and meta-analyses**.** You can think of these as "studies of studies." They attempt to combine all of the relevant studies that have been conducted on a research question and summarize their overall conclusions. Researchers conducting a ***systematic review*** formulate a research question and then systematically and independently identify, select, evaluate, and synthesize all high-quality evidence that relates to the research question. Since systematic reviews combine the results of many studies, they help researchers produce more reliable findings. A ***meta-analysis*** is a type of systematic review that goes one step further, combining the data from multiple studies and using statistics to summarize it, as if creating a mega-study from many smaller studies**.**[4]

However, even systematic reviews and meta-analyses aren't the final word on scientific questions. For one thing, they're only as good as the studies that they include. The Cochrane Collaboration is an international consortium of researchers who conduct systematic reviews in order to inform evidence-based healthcare, including nutrition, and their reviews are among the most well-regarded and rigorous in science. For the most recent Cochrane review of the Mediterranean diet and cardiovascular disease, two authors independently reviewed studies published on this question. Based on their inclusion criteria, 30 RCTs with a total of 12,461 participants were included in the final analysis. However, after evaluating and combining the data, the authors concluded that "despite the large number of included trials, there is still uncertainty regarding the effects of a Mediterranean-style diet on cardiovascular disease occurrence and risk factors in people both with and without cardiovascular disease already." Part of the reason for this uncertainty is that different trials found different results, and the quality of the studies was low to moderate. Some had problems with their randomization procedures, for example, and others were judged to have unreliable data. That doesn't make them useless, but it adds to the uncertainty about this question, and uncertainty pushes the field forward towards more and better studies. The Cochrane review authors noted that they found seven ongoing trials of the Mediterranean diet, so we can hope that they'll add more clarity to this question in the future.[5]

Science is an ongoing process. It's often a slow process, and it contains a lot of uncertainty, but it's our best method of building knowledge of how the world and human life works. Many different types of studies can contribute to scientific knowledge. None are perfect—all have limitations—and a single study is never the final word on a scientific question. Part of what advances science is that researchers are constantly checking each other's work, asking how it can be improved and what new questions it raises.

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1.4: Nutrition Research Statistics

One important aspect in being able to interpret research is to have a basic understanding of statistical significance. Statistical significance means that there is sufficient statistical evidence to suggest that the results are most likely not due to chance.

Statistical significance is represented by p-values in most research. The p-value is an estimate of whether the difference is a statistical accident or due to random chance. A p-value of less than 0.05 (commonly written p-value <0.05 or p <0.05) is used in most cases to indicate statistical significance. This value means that 5% of the time the statistical results are accidental or not true. Researchers accept this level of uncertainty. Figure 1.4.1 demonstrates how to interpret p-values in a humorous way.

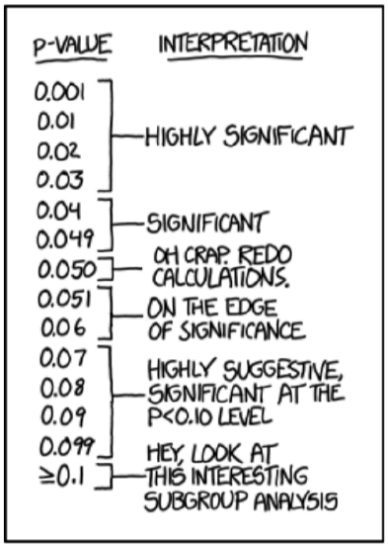


Figure 1.4.1: p-value interpretation. (CC BY-NC 2.5; xkcd)

Epidemiological research usually uses different statistics to analyze their results. Epidemiological results are commonly reported as odds ratios (ORs), relative risks (RRs), or hazard ratios (HRs). These values can be interpreted similarly regardless of which is used. For example, the odds ratio represents the odds of a certain event occurring (often a disease) in response to a certain exposure (in nutrition this is often a food or dietary compound). In a paper it is common to see one of these measures in this form: OR = 2.0. What does this mean? As Figure 1.4.2 shows, an OR, RR, or HR of 1 means that exposure is associated with neither increased or decreased risk (neutral). If an OR, RR or HR is less than 1, that exposure is associated with a decreased risk. If an OR, RR, or HR is greater than 1, that exposure is associated with an increased risk. An OR,RR, or HR of 2 means there is twice the risk, while an OR, RR, or HR of 0.5 means there is half the risk of the exposure versus the comparison group.

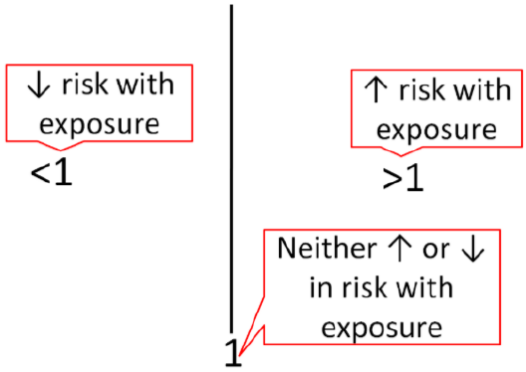


Figure 1.4.2: Risk in relation to exposure for OR, RR, or HR

To determine whether OR, RR, and HR are significantly different for a given exposure, most epidemiological research uses 95% confidence intervals. Confidence intervals indicate the estimated range that the measure is calculated to include. They go below and above the OR, RR, and HR itself. It is a calculation of how confident the researchers are that the OR, RR, and HR value is correct. Thus:

Large Confidence Intervals = Less Confidence in Value

Small Confidence Intervals = More Confidence in Value

Thus, 95% confidence intervals indicate that researchers are 95% confident that the true value is within the confidence intervals. A confidence interval is normally written in parentheses following the OR, RR, or HR or represented as bars in Figure 1.4.3.

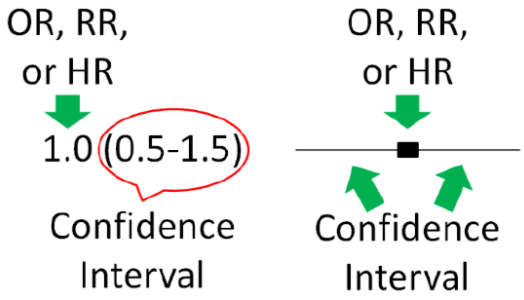


Figure 1.4.3: Confidence Intervals for OR, RR, or HRs in text form (left) and figure form (right)

Most of the time, the OR, RR, or HR will be found in the middle of the 95% confidence interval, but not necessarily all of the time. For instance, there could be much greater confidence that the value is not much lower than the OR, RR, or HR, but not much confidence that the value does not exceed the OR, RR, or HR. This could lead to confidence interval looking skewed above the OR, RR, or HR (more confidence interval above, than below, the OR, RR, or HR).

If the 95% confidence intervals of the OR, RR, or HR does not include or overlap 1, then the value is significant. If the 95% confidence intervals include or overlap 1, then the OR, RR, or HR is not significant, because it is possible the the true value is 1, which is neutral, and can not be significantly different than 1 (Figure 1.4.4).

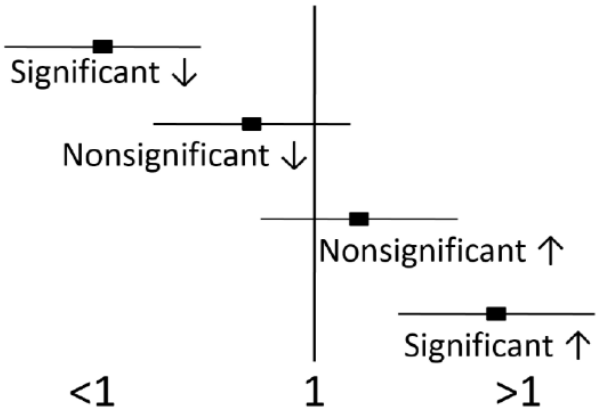


Figure 1.4.4: Confidence intervals (95%) that include 1 indicate that the value is not significantly different. Confidence intervals above or below 1 without including it indicate that the value is significantly different.

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1.5: Publishing Research

After nutrition researchers have obtained their results, they want to disseminate them, or let people know what they found. The primary way they do this is by publishing their results in journals. The researchers put together a paper explaining what they did and what they found in a journal article. An article's primary components are normally an introduction, abstract, methods, results, and discussion/conclusion. They submit the paper to a chosen journal and the journal editor then selects expert researchers who will critically review the article. These reviewers make sure that research published in journals is of good quality and of interest to readers. In more rigorous journals the article might also need to meet a certain theme of an issue that a journal wants to publish. This is a rigorous process that is humorously depicted by this cartoon.

Web Link

Peer Review Process

To give you an idea of how rigorous this process is, let's consider some major nutrition journals.

- Journal of Nutrition (JN)
- American Journal of Clinical Nutrition (AJCN)
- Journal of the Academy of Nutrition and Dietetics (formerly Journal of the American Dietetic Association)
- Nutrition Reviews
- Annual Reviews of Nutrition
- British Journal of Nutrition
- European Journal of Clinical Nutrition

There are two major nutrition societies in the US: The American Society for Nutrition (ASN) and the Academy of Nutrition and Dietetics (AND, formerly the American Dietetic Association). ASN publishes the Journal of Nutrition and the American Journal of Clinical Nutrition, while AND publishes the Journal of the Academy of Nutrition and Dietetics. If you want to see more about the major nutrition societies, use the following links.

Web Links

- American Society for Nutrition
- Academy of Nutrition and Dietetics

The following table contains 2 measures, impact factor and acceptance rate for these journals. The impact factor is a measure of the influence of the journal. This measure indicates how many people read the articles that are published in that journal. The acceptance rate is the % of articles that are submitted that are actually accepted for publication.

Table 1.5.1: Selected nutrition journal impact factors and acceptance rates

Journal	Impact Factor[1]	Acceptance Rate
Annual Reviews of Nutrition	6.8	
American Journal of Clinical Nutrition	6.7	25%[2]
Journal of Nutrition	3.7	25%[3]
Advances in Nutrition	5.2	
Nutrition Reviews	5.6	
Journal of the Academy of Nutrition and Dietetics	3.6	
British Journal of Nutrition	3.3	
European Journal of Clinical Nutrition	3.9	40%[4]

The acceptance rate for three of these journals ranged from 25-40%. Thus, the majority of submitted articles are rejected and sent back to the researchers. To put nutrition journals in perspective, some of the top medical and science journals with a broad

following have impact factors as high as 75 and an acceptance rate of 5-10%.

Hopefully these numbers help you understand that peer review is a rigorous process where peer reviewers "tear the article to pieces."



Figure 1.5.1: Dr. L's article after peer review

They do not physically shred the article (it is all done online), but there are often extensive revisions to make (maybe even multiple times) before the paper can be published, if you're so lucky. Generally, the more difficult it is to get a paper accepted into a journal, the more solid the research must be. Most of the information on the internet has not gone through peer review and should be explored with some caution.

The following video clearly depicts the peer review process. There is also a diagram in the link below that explains how the peer review process works.



Video 1.5.1: How do articles get peer reviewed? What role does peer review play in scholarly research and publication? This video will explain. https://www.youtube.com/watch?v=rOCQZ7QnoN0

Web Link

Peer Review Process Diagram

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1.6: Interpreting Research

Now that you are familiar with the different forms of nutrition research, the next step is understanding how to interpret and synthesize the information. To synthesize information on a certain topic, the two most popular methods are meta-analyses and systematic literature reviews. While there are differences between these two methods, they are similar in that they aim to draw a conclusion from the body of research evidence rather than from one study. We will focus on systematic literature reviews because of their rising popularity in biomedical literature.

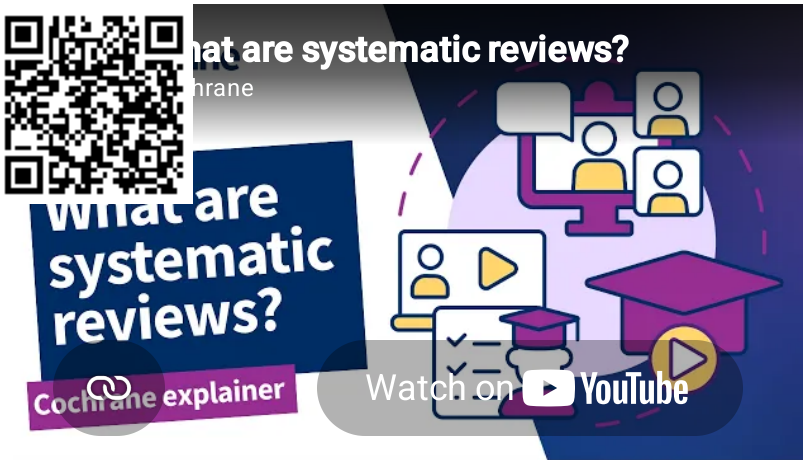
A systematic literature review does what the name implies, it systematically reviews the literature related to a certain research question. For example, the research question might be, "Does chocolate decrease blood pressure?" There is a method for performing the review established ahead of time that details answers to questions such as:

- How will journal articles be identified?
- Using what databases?
- What search terms will be used?

The end product is a conclusion based on the evidence in the identified journal articles. The figure below illustrates how a systematic literature review identifies articles to utilize.

Figure 1.6.1: An example of the process of a systematic literature review.

The video below, by the Cochrane Collaboration that performs many systematic literature reviews, describes what systematic literature are.



Video 1.6.1: This video explains why systematic reviews are important and how they are done. This includes an explanation of how the effects of interventions are compared in order to provide evidence. https://www.youtube.com/watch?v=egJlW4vkb1Y

Because they synthesize the findings from multiple trials or studies, systematic literature reviews are considered the highest level of nutrition research evidence and are therefore shown at the top of the strength of nutrition research pyramid below. In vitro studies are shown at the bottom of the triangle because they are the weakest form of evidence overall. It should be pointed out that most systematic literature reviews only consider epidemiological studies and clinical trials and do not include animal studies or in vitro evidence. While these studies are of less strength, they should still be considered.

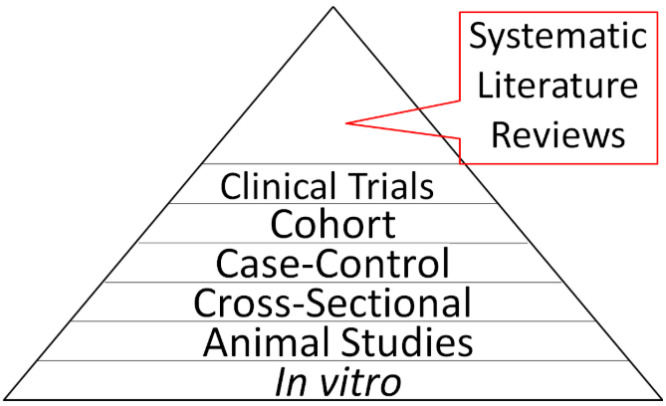


Figure 1.6.2: Strength of scientific research, a higher position on the pyramid means greater strength of that form of evidence.

There are a couple of other factors to consider relating to the different forms of research. First, epidemiological studies cannot show causality (i.e. smoking causes lung cancer), but instead identify relationships or associations (i.e. smoking is associated with lung cancer occurrence). Clinical trials/human studies are the best form of primary research because their findings should be directly translatable to patients. So why use other forms of research? The description below should help explain why the other forms of research are also important.

In general, a certain sequence of studies in nutrition research is often followed as shown in the figure below.

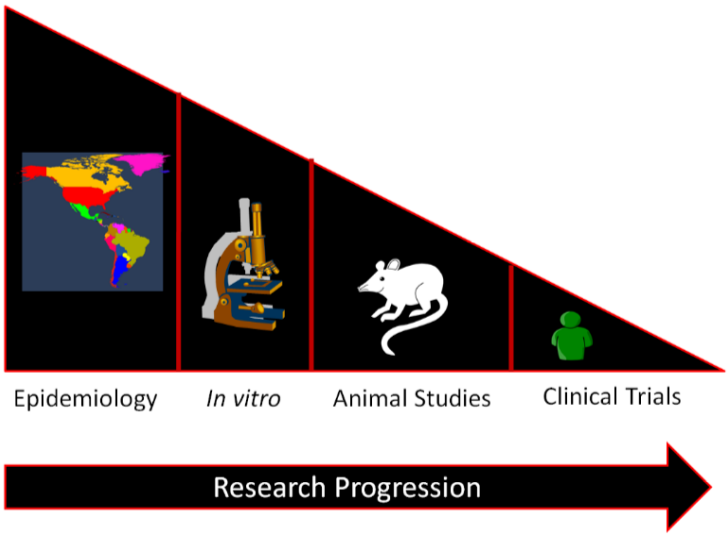


Figure 1.6.3: The progression of nutrition research. The shape indicates the selection of the most promising and safest hypotheses being moved to the next level. Thus, there is a decrease in the overall number of hypotheses represented by the height of the figure) being investigated by the next form of research.

Epidemiological studies find relationships between food/food components and a specific health outcome. This relationship is then investigated by in vitro studies and then, some of the most promising move to animal studies. Then the most promising and safe food/food components are moved into clinical trials/human studies. If it is an individual compound, there will be smaller trials designed to see if the compound is safe before it is moved into larger clinical trials to determine whether the food/food component results in beneficial health outcomes. The overall effect of this process is to select the most promising and safe food/food components for the clinical trials/human studies. This allows time and money to be used more efficiently, because while clinical trials/human studies are the best form of research, they are also normally the most expensive and time-consuming.

Researchers nevertheless have been tempted to skip directly to clinical trials in the past rather than following the research progression. To illustrate what happens in these situations, the following describes a couple of examples when "normal" research progression hasn't been followed.

Beta-Carotene and Lung Cancer

In the early 1980s there was a lot of excitement among researchers over the epidemiological evidence showing that higher dietary consumption of the carotenoid, beta-carotene, decreased lung cancer risk[1]. By the mid 1980's, two large, randomized, double-blind placebo-controlled trials began to determine whether high-dose beta-carotene supplementation (far higher than dietary intake) could decrease lung cancer incidence in high-risk populations before in vitro or animal studies had investigated this relationship. The research community was shocked when these two studies were terminated early in the mid 1990s because of significant increases in lung cancer incidence among smokers receiving beta-carotene supplements[2,3]. In vitro and animal studies completed after the clinical trial found that as beta-carotene intake shifts from normal dietary levels to high, supplement-type levels, the effect on lung cancer development also shifts from beneficial to detrimental in combination with smoke or carcinogen exposure[4]. Thus, if the normal research progression had been followed, it is likely that a lower dose of beta-carotene would have been used or trials wouldn't have been undertaken at all.

Selenium, Vitamin E, and Prostate Cancer

Another example of when the research progression was not followed was the relationship between selenium, vitamin E, and prostate cancer. Two clinical trials had found secondary outcomes that suggested that selenium and vitamin E supplementation may decrease prostate cancer risk [5,6]. A secondary outcome is one that was not the primary outcome that the clinical trial was designed to find, thus they need to be interpreted with some caution. Rather than examining the relationship using in vitro and animal studies, a clinical trial was undertaken to determine if selenium and vitamin E supplementation alone, or in combination, could decrease the development of prostate cancer incidence[7]. This clinical trial was also terminated early because of a nonsignificant increase in prostate cancer in those receiving vitamin E[8], and a nonsignificant increase in diabetes among those receiving selenium[9]. In vitro studies and animal models performed since the clinical trial was undertaken and after its termination suggest that vitamin E is not effective and that another form of selenium could have possibly been more effective[10].

In addition to the lessons learned about the sequence of research in nutrition, these studies add to growing evidence that suggests that single-agent interventions, even in combination, may not be an effective strategy for improving health. The common nutrition research approach was, after epidemiology finds an association or relationship, is to use in vitro and animal studies to identify the specific compound in a certain food that is responsible. This has been termed the reductionist approach because it takes something complex (food) and reduces it down to its simpler components. However, there is growing evidence that this may be a flawed approach. Some nutrition researchers feel that more focus should be on the food itself, rather than trying to discern exactly what is responsible for the beneficial health outcomes. Because it may not be one or 2 compounds alone that are responsible for the effect, it might be difficult to determine from the multitude of nutrients in foods which are responsible for the beneficial effect. This will mean changes in the overall research approach, especially at the human intervention studies/clinical trials level, because in most cases there is not a way to give a "placebo food"[11,12].

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1.7: Healthy Skepticism in Nutrition Science

By this point in the unit, you should understand the types of studies used in nutrition research and the quality of evidence each can provide. As you sift through studies, there are a few limitations of nutrition research that are always worth keeping in mind:

- **Challenges in nutrition research:** There are some inherent challenges to researching what people eat and how it affects their health. This fact limits the quality of evidence and stirs controversy in nutrition research.
- **Influence of food industry funding:** Because government funding for nutrition research is limited, much of it is funded by the food industry. Industry's primary goal is to sell more of their products, so they have a conflict of interest that can result in bias in the way they design studies and interpret the results.

Being alert to these two things means always examining nutrition research with a healthy sense of skepticism. Let's take a closer look at these two issues in nutrition science.



Challenges in Nutrition Research

How does the food we eat affect our health? This question is exceedingly difficult to answer with certainty. We all need to eat every day, but we can choose from a huge array of possible foods in different combinations. And it's probably not what we eat on any given day that matters, but what we eat over months and years and decades—our long-term eating patterns—that matter to our long-term health.

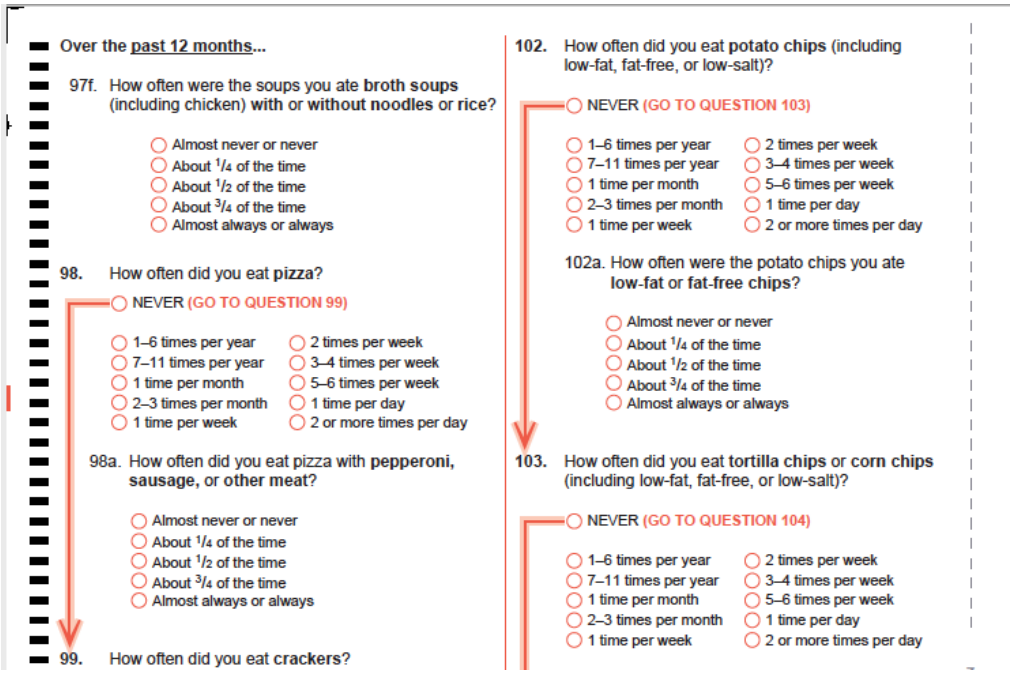
Imagine that you're a nutrition researcher, and you've made the **observation** that over the last 50 years in the U.S., people have been consuming more and more processed foods (foods made with refined ingredients and industrial processes, usually with the addition of sugar, fat, and/or salt). You **hypothesize** that processed foods are contributing to obesity, which has also increased over the last 50 years. You might first **test** your hypothesis in **animal studies** by feeding mice and rats a buffet of potato chips, soda, and Twinkies, and measuring changes in their body weight. You might find that the animals do, in fact, gain weight on this diet. However, you know that what is true in rodents isn't always true in humans, and you'll need to study humans in order to understand the role of processed foods in the obesity epidemic.

Your next step might be to conduct an **observational study**, the most common type of study design in human nutrition research. For example, you might do a **cross-sectional study** where you compare groups of people who eat a lot of processed foods with those who eat very little. Or you might conduct a **prospective cohort study** in which you ask people how much processed foods they eat and then follow them over time, looking for correlations between processed food consumption and their body composition.

These types of studies have been conducted, and they've found correlations between consumption of processed foods and obesity. For example, a cross-sectional study published in 2018 compared the consumption of processed foods and the prevalence of obesity in 19 European countries and found that countries where people eat more processed foods also have a greater prevalence of obesity.[1] A prospective cohort study published in 2016 followed nearly 8,500 university graduates in Spain and found that those who ate more processed foods were more likely to be overweight or obese 9 years later.[2]

From these results, can we conclude that eating more processed food *causes* weight gain? Nope. It's a tempting conclusion, but this brings us to the first major problem with nutrition research: **Observational studies can only show that two variables (eating processed foods and obesity, in this case) are *correlated*, not that one causes the other.** This distinction is especially important in nutrition because **diet is intertwined with many other lifestyle and socioeconomic factors that also affect health outcomes**. For example, people who eat more processed food might also eat fewer fruits and vegetables, exercise or sleep less, have more stress, or have less access to preventative healthcare. These are just a few of the **confounding factors** that could explain the observed correlation between processed food consumption and weight gain. Weight gain might have nothing to do with processed food and instead be driven by one or all of these factors, or others that we haven't considered.

The second major problem with observational nutrition research is that it's difficult to accurately quantify what and how much people eat, especially over long periods of time. Epidemiological studies usually rely on questionnaires that ask people to remember how much food they ate, but people are notoriously bad at remembering this type of information, and sometimes we fudge the truth. For example, you might remember that you had a cup of coffee but forget that you added cream, completely forget about a mid-morning muffin snack, or guess that you ate 2 cups of veggies when it was closer to 1.5 cups. And many diet questionnaires, called food frequency questionnaires, ask people to recollect and mentally average their food and beverage intake for the last 12 months, not just yesterday. The image below shows part of a page from a 24-page National Health and Nutrition Examination Survey (NHANES) food questionnaire, a national survey often used for research on country-wide dietary patterns. As you can see, these questions are detailed, and there's plenty of room for small errors to accumulate.



Over the past 12 months...

97f. How often were the soups you ate **broth soups** (including chicken) **with** or **without noodles** or **rice**?

- Almost never or never
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

98. How often did you eat **pizza**?

- NEVER (GO TO QUESTION 99)
- 1–6 times per year
- 7–11 times per year
- 1 time per month
- 2–3 times per month
- 1 time per week
- 2 times per week
- 3–4 times per week
- 5–6 times per week
- 1 time per day
- 2 or more times per day

98a. How often did you eat pizza with **pepperoni, sausage, or other meat**?

- Almost never or never
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

99. How often did you eat **crackers**?

102. How often did you eat **potato chips** (including low-fat, fat-free, or low-salt)?

- NEVER (GO TO QUESTION 103)
- 1–6 times per year
- 7–11 times per year
- 1 time per month
- 2–3 times per month
- 1 time per week
- 2 times per week
- 3–4 times per week
- 5–6 times per week
- 1 time per day
- 2 or more times per day

102a. How often were the potato chips you ate **low-fat** or **fat-free chips**?

- Almost never or never
- About 1/4 of the time
- About 1/2 of the time
- About 3/4 of the time
- Almost always or always

103. How often did you eat **tortilla chips** or **corn chips** (including low-fat, fat-free, or low-salt)?

- NEVER (GO TO QUESTION 104)
- 1–6 times per year
- 7–11 times per year
- 1 time per month
- 2–3 times per month
- 1 time per week
- 2 times per week
- 3–4 times per week
- 5–6 times per week
- 1 time per day
- 2 or more times per day

Figure 2.5. A sample page from the NHANES Food Questionnaire.

A third challenge in nutrition research is that diet is just so complex. Stanford physician and researcher John Ioannidis, a frequent critic of observational nutrition research, described the complexity of diet in a 2018 editorial published in JAMA: "Individuals consume thousands of chemicals in millions of possible daily combinations. For instance, there are more than 250,000 different foods and even more potentially edible items, with 300,000 edible plants alone." He also points out that how an individual responds to a particular dietary pattern can be influenced by genetics, age, and the way they metabolize nutrients. "Disentangling the potential influence on health outcomes of a single dietary component from these other variable is challenging, if not impossible," Ioannidis wrote.[3]



Returning to the question of processed foods, all three of these challenges impact how we interpret observational studies that show a correlation between processed food consumption and weight gain. It doesn't mean that these studies are useless, but we want to be aware of their limitations and consider other ways to test the hypothesis. One way to overcome these challenges is to conduct a **randomized controlled trial (RCT)**, the study design that gives us the highest quality evidence. RCTs are time and funding-intensive experiments, so they're usually only conducted after consistent evidence from observational and laboratory studies has accumulated.

It turns out that there has been a randomized controlled trial of processed foods and weight gain. It was funded by the National Institutes of Health and published in 2019 in the journal *Cell Metabolism*.[4] In this study, 20 participants lived in the NIH's Clinical Center for one month, where they consumed only processed foods for two weeks and only unprocessed foods for another two weeks, and they could eat as much or as little as they liked during each of these periods. The diets were carefully designed by dietitians so that they were matched in calories, sugar, fat, fiber, and macronutrients, and the exact amounts consumed by the participants were measured every day (solving the problem of measuring diet complexity and accurately describing what and how much people eat every day).

The study found that people ate about 500 kilocalories more and gained about a pound per week when they were eating processed foods. **This study design could show causation, not just correlation,** because the other nutritional factors like calories, sugar, fat, fiber, and macronutrients were held constant, and the diets were tested in the same people, so other factors such as genetics, sleep, stress, and exercise were constant between the two types of diets. (This was an example of a crossover randomized controlled trial, in which each subject serves as their own control, and they completed the processed and unprocessed phases of the trial in random order.)



Figure 2.6. At left, researchers Kevin Hall and Stephanie Chung talk with one of the processed foods trial participants at the NIH Clinical Center, an inpatient facility where participants lived for the duration of the study. At right, an NIH worker prepares meals for participants in the center's kitchen. All meals were provided for study participants to carefully control their diet during the trial.

This study suggested something very important—that food processing causes people to eat more food and gain weight. However, even the best study design has limitations. For one thing, this study was small (just 20 participants), and it only lasted for two

weeks, so we don't know if the findings apply to the general population over a lifetime of complex, ever-changing diets. The next steps will be to try to repeat the study in another group of people to see if the finding holds and to design studies to figure out why processed foods cause increased caloric intake.

As you evaluate nutrition research, especially observational studies, keep in mind the inherent challenges of nutrition research and look for randomized controlled trials that can help solve those challenges. Even for randomized controlled trials, consider their limitations, and know that **one study is never enough to fully answer a question in the complex field of nutrition**.

Industry Influence: Follow the Money

Understanding how diet influences health is a pressing need. By some estimates, a suboptimal diet is the single greatest changeable risk factor contributing to death and disability worldwide, and in the United States, the cost of diet-related chronic diseases are estimated to be as high as $1 trillion each year.[5] Yet, for all its importance, nutrition science has long suffered from a lack of government investment, with only about 5 percent of the National Institutes of Health (NIH) budget, or $1.8 billion, directed towards research on how the foods we eat affect our health, according to a 2019 investigation by Politico. "In 2018, NIH funding for cancer, which affects just under 9 percent of the population, was $6.3 billion. Funding for obesity, which affects about 30 percent of the country, was about $1 billion," the article noted.[6]

With so little government funding for nutrition science, who is funding the rest of the studies that feed the constant news cycle? Many are funded by food companies and industry groups, either to conduct studies in their own research divisions or in the form of grants given to university scientists. That's problematic, because food companies and industry groups have an inherent bias or conflict of interest. Their primary goal is to promote their products and to sell more of them—not to advance knowledge of food and health—and this affects how they frame research questions, design and interpret studies, and report their results.

Marion Nestle, a retired nutrition professor at New York University, has written extensively about this problem. For a year in 2015-2016, she informally tracked industry-funded studies and found that 90 percent of the time, their conclusions benefited the industry that funded them. In another example, a 2013 meta-analysis found that among studies that looked at whether soda consumption contributed to obesity, those funded by the soda industry were five times more likely to conclude that it doesn't contribute to obesity compared to those not funded by the industry.[7] (Consider the processed foods RCT we just discussed. It was funded by the National Institutes of Health, which doesn't have a stake in the results. Would you trust the results of a study of processed foods if it was funded by Nabisco? Or for that matter, the Broccoli Growers of America? Probably not.)

There's likely a long history of biased nutrition research influencing dietary advice. For example, in the 1960s, the sugar industry paid well-respected academic scientists to publish research concluding that it was fat—not sugar—that was detrimental to heart health.[8] (Both too much fat and too much sugar can negatively affect heart health, but it benefited the sugar industry to focus the blame on fat.) As recently as 2015, Coca-Cola was funding research meant to promote lack of physical activity as the main cause of obesity, shifting blame away from dietary factors, such as drinking soda.[9] When corporations intentionally invest in research that takes attention from scientific findings that could harm their bottom line, they create more doubt and uncertainty, which can slow the process of reaching consensus and making policy changes that could improve people's health. There's a long history of this type of behavior, as described in a recent Scientific American article:

> *"Corporations and other interests with a financial or political stake in outcomes use **agnatogenesis—the deliberate creation of doubt**—to undermine confidence in scientific findings. Typically, the aim is to create enough uncertainty to stave off regulatory action. For example, the tobacco industry tried to cast doubt on findings linking smoking to cancer, and fossil fuel companies have tried to undermine scientific evidence of anthropogenic climate change."*[10]

Media attention has made researchers and policy makers much more aware of the problems with industry funding and conflicts of interest in nutrition research, and they're working to solve them. But regardless, if you see reports of a study that shows that blueberries can block bladder infections, pistachios can prevent pancreatitis, or cinnamon can cure cancer… Well, you should be skeptical, and always check the funding source. Studies on a single type of food are almost always industry-funded.

How to find clarity in a complex field

Let's review some of the key issues:

- Nutrition research is really difficult to do well. We want to know how nutrition relates to health over the long term, but it's hard to quantify how people eat over a lifetime and track them for long enough to see an impact.
- We often rely on observational studies, which can only show that two variables are *correlated*, not that one causes the other.
- Randomized controlled trials are rare, and they're often small, short-term studies that may or may not tell us what happens in the real world.
- Diet is exceptionally complex, with countless combinations of different nutrients and foods.
- One study is never enough to fully answer a question in the complex field of nutrition.
- Nutrition research is often funded by the food industry, which can be biased towards results that benefit business, not human health.

All of this can be discouraging, but you should also know that researchers are working hard to improve the quality of nutrition research and to interpret it honestly for the rest of us. As a consumer of nutrition information, use a skeptical eye when you read news of the latest nutrition research. Look for areas of consensus, where committees of experts have put their heads together to come up with the best advice they can based on the evidence we have, such as in the Dietary Guidelines for Americans. You'll find that while experts in this field are often debating the latest controversy, they also agree on a lot. As we continue on in this unit, we'll talk more about how to find accurate sources of information and who you can trust for evidence-based advice in the field of nutrition.

Self-Check:

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1.8: Finding Accurate Sources of Nutrition Information

In this unit, we've already discussed how to fact-check health claims encountered in the news or on social media and how to assess expertise in the field of nutrition. On this page, we expand our information literacy toolkit to include strategies for searching for accurate sources of health and nutrition information. These approaches become more important if you're seeking answers to a specific question, writing a paper for a class, or building your knowledge base for personal or professional reasons. In these scenarios, you need to do more than fact-check single claims or bits of nutrition information that come across your social media feeds. Instead, you'll need to sift through and assess many different resources, and you'll find that it's helpful to build a list of trusted sites and organizations that you can head to when you want to look something up.

Imagine that you're curious about the safety and efficacy of a nutritional supplement. You do a quick internet search, which yields pages and pages of search results. Among them are links to news articles, peer-reviewed studies, hospital and university websites, government agencies, blogs, sites selling supplements, YouTube videos, online discussion threads, and more. You can't read them all, and nor would you want to. Where do you even begin?



Searching for Online Health and Nutrition Information

If you're researching the safety and efficacy of a nutritional supplement, you probably don't want to start by reading 100 peer-reviewed studies or a bunch of different opinions from individuals. That approach is overwhelming and time consuming, and it leaves you vulnerable to misinformation. Instead, you'll want to **start with trusted websites that summarize the scientific consensus**, such as these from the following sources:

- Government agencies, such as the National Institutes of Health (NIH), Food and Drug Administration (FDA), Centers for Disease Control and Prevention (CDC), and other websites ending in .gov, like PubMed and MedlinePlus.
- Colleges and universities, such as the Harvard School of Public Health (websites ending in .edu).
- Well-known healthcare and hospital systems, such as Mayo Clinic or Cleveland Clinic (websites usually ending in .org).
- Professional organizations, such as the Academy of Nutrition and Dietetics, the American Heart Association, the American College of Sports Medicine, the American Academy of Pediatrics, and the American Cancer Society (websites usually ending in .org).

We mention website domains because .gov and .edu sites are generally accurate sources of information. However, .org and .com domains are a mixed bag. Sites ending in .org generally represent organizations, including some of the trusted organizations listed above. But organizations can also be biased, and their sites may be more focused on pushing a certain agenda than representing the scientific consensus. In fact, any entity can buy a .org domain. Likewise, .com websites can be valuable sources of information, or they may be more interested in selling you something. When you encounter a .org or .com site, you'll want to do more digging to understand the site's intent. If an organization is unfamiliar to you, practice lateral reading (e.g., a Wikipedia check) to learn more.

Keep in mind that organizations can represent many different interests, and biased organizations can have names that are deceptively official-sounding.



Beyond investigating the organization, corporation, or individual behind a website or article, here are some other aspects to evaluate:

- **Timeliness** — How old is the article? Because science is always evolving, articles published in about the last 5 years are preferred, as they'll have more current information. However, this isn't a hard and fast rule. Sometimes older articles provide important context, and sometimes an article that is even one year old is already out-of-date. (Think of how quickly information was emerging and changing during the COVID-19 pandemic!)
- **Relevance** — Is this information relevant to your topic? Or is it a distraction?
- **Credibility** — Does the information appear to be free of conflict of interest and bias? Does it cite or link to relevant peer-reviewed studies? Does it represent the findings accurately and fairly?
- **Expertise** — Whose expertise and views are represented? Based on what you learned earlier in this unit, do they have the appropriate expertise to provide accurate information on this topic?
- **Purpose** — What do you think is the purpose of this article or website? Is it intended to be educational? Is it an opinion piece, meant to convince you of one side or the other of an issue? Is it trying to get you to buy something or donate to a cause, or to attract more clicks? Is the language and layout inflammatory or extreme? Thinking about the author's purpose in creating the information or website can help you figure out if it is credible and useful to you.

Evaluating Health and Nutrition News

Health and nutrition content in both online and print media often comes in the form of news stories. Publications like to highlight what's new, and many consider it part of their mission to report information about new scientific studies. Evaluating health and nutrition news gives you a chance to apply what you've learned about types of studies and quality study design. Here are some things to look for and keep in mind:

- **The news source should be reputable.** Larger, national news sources like the New York Times, Washington Post, and National Public Radio have dedicated health and science reporters who know how to evaluate studies and will seek out multiple experts to provide additional insights. They also have editors and fact checkers to double check their work.
- **The new study should be published in a peer-reviewed journal.** As you've learned, peer review is a system of checking the quality and interpretation of the research before it's published. Most studies that are truly newsworthy should have gone through the peer review process before we give them much attention. You'll sometimes see news stories about studies that have been

presented at conferences or published as preprints (released before peer review); these may be interesting, but their conclusions should be viewed with caution.

- **The news article should provide context of previous research and comments from outside experts.** Remember that one study on its own doesn't usually tell us much, at least when it comes to making decisions about our own health. A good news article will tell us what was previously known about the topic and how the new study adds to our understanding. It will also include comments from experts who were not involved in the new study and who can discuss its limitations and relevance.



- **The study methodology should be sound and provide outcomes that are relevant.**
  - Consider the type of study and where it sits in the hierarchy of evidence. A study in humans is likely more meaningful than one conducted in cells or in animals; an intervention study is usually more meaningful than an observational study; and systematic reviews and meta-analyses often give you the best synthesis of the science to date.

- Check the details of the study design. How many participants were included? How long did the study last? If it's an intervention study, check for some of the attributes of high-quality research, such as randomization, placebo control, and blinding.
- Consider the real-world relevance and confounding factors. If an animal study reports that an artificial sweetener causes cancer, check to see how much of the sweetener was tested. If it was an amount 1,000 times normal consumption in humans, that raises questions of relevance. Likewise, if an observational study of blueberries and dementia risk reports that people who ate two servings of blueberries per day had an 8.5% risk of developing dementia compared to a 9% risk in those who didn't eat blueberries, this is a small difference in risk with questionable real-world relevance and might be explained by confounding factors (e.g., people who eat more blueberries live in neighborhoods with less air pollution, get more exercise, etc).

Following health and science news will make you a more informed consumer and citizen, and it's great practice applying the tools of information literacy that you're learning in this course.

Building a Bank of Trustworthy Sources

If you find yourself regularly searching for and evaluating online health and nutrition information, it can be helpful to build a list of go-to sources that you know you can trust. We've provided a starter list here, but you can add your own that are relevant to your areas of interest and that you can return to again and again when searching for information or fact-checking claims online.

US Government Websites:

- Centers for Disease Control and Prevention – https://www.cdc.gov
- ChooseMyPlate – https://www.choosemyplate.gov/
- Food and Drug Administration – http://www.fda.gov/
- Foodsafety.gov – https://www.foodsafety.gov/
- Healthy People – https://www.healthypeople.gov/
- MedlinePlus – https://medlineplus.gov/
- National Center for Complementary and Integrative Health – https://nccih.nih.gov/
- National Heart, Lung, and Blood Institute – https://www.nhlbi.nih.gov/health-topics
- National Institutes of Health Office of Dietary Supplements – https://ods.od.nih.gov/
- Nutrition.gov – https://www.nutrition.gov/
- Nutrition Evidence Systematic Review – https://nesr.usda.gov/
- Office on Women's Health – https://www.womenshealth.gov/
- Pubmed – https://pubmed.ncbi.nlm.nih.gov/

International Websites:

- Food and Agricultural Organization of the United Nations – https://www.fao.org/home/en
- World Health Organization – https://www.who.int/

Education and Organization Websites:

- American Cancer Society – https://www.cancer.org/
- American Diabetes Association – http://www.diabetes.org/
- American Heart Association – https://www.heart.org/
- American Society for Nutrition – http://www.nutrition.org/
- Association for Size Diversity and Health – https://asdah.org/
- Center for Science in the Public Interest – https://cspinet.org/
- Eat Right (from the American Academy of Nutrition and Dietetics) – https://www.eatright.org/
- Family Doctor (from the American Academy of Family Physicians) – https://familydoctor.org/
- Food Allergy Research & Education – https://www.foodallergy.org/
- GI Patient Center (from the American Gastroenterological Association) – https://patient.gastro.org/
- Harvard School of Public Health – https://www.hsph.harvard.edu/nutrition/
- Healthy Children (from the American Academy of Pediatrics) – https://healthychildren.org
- Institute of Medicine: Food and Nutrition – http://nationalacademies.org/hmd/Global/Topics/Food-Nutrition.aspx
- Linus Pauling Institute – http://lpi.oregonstate.edu/
- Mayo Clinic – https://www.mayoclinic.org/

- National Eating Disorder Association – https://www.nationaleatingdisorders.org/
- Sugar Science – http://sugarscience.ucsf.edu/

News and Media Websites:

- BBC News Health – https://www.bbc.com/news/health
- CNN Health – https://www.cnn.com/health
- Kaiser Health News – https://kffhealthnews.org/
- Knowable Magazine – https://knowablemagazine.org
- National Public Radio – Shots Health News – https://www.npr.org/sections/health-shots
- The New York Times Health and Wellness – https://www.nytimes.com/section/health; https://www.nytimes.com/section/well
- Time Health – https://time.com/section/health/
- The Washington Post – https://www.washingtonpost.com; https://www.washingtonpost.com/wellbeing/
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Self-Check:

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1.9: Who Can You Trust for Nutrition Information?

When looking for credible nutrition information, one of the most important aspects to consider is the expertise of the individual providing the information.

What Does It Mean to Have Expertise in the Field of Nutrition?

Expertise in nutrition can be tricky to assess, because many people claim expertise yet lack formal training in the field. But **formal training, obtained through advanced study at a college or university and assessed by meeting credentialing and/or degree requirements, is the best indicator of expertise in any field**, because it shows an investment in gaining foundational knowledge from experienced educators and practitioners who specialize in the area. This level of expertise is very difficult to obtain without the rigor of a college or university training program. People may believe that they have gained expertise in nutrition through self-taught study, such as by reading books, studies, and articles; listening to podcasts; watching YouTube videos; and through observation of what foods make *them* feel good or ways of eating *they* enjoy. These sources of information can be valuable (though they can also sometimes contain misinformation), but it is difficult to truly develop self-taught expertise, because we are so easily led astray by our own biases and can be unaware of our blind spots about food and nutrition.



Let's consider for a moment why expertise is important. If you had an electrical problem in your home or a mechanical problem with your car, or if you had a broken bone or a heart attack, you probably wouldn't seek services or treatment from a celebrity, a social media influencer, or a tech executive. Instead, you would look to someone with specific training in the issue facing you, such as an electrician or mechanic who had completed a vocational program and a supervised apprenticeship, or an orthopedist or cardiologist with years of specialized training in their fields. If you tore a ligament in your knee, you wouldn't trust a cardiologist, much less a mechanic or a celebrity, to do orthopedic surgery on your joint. You also wouldn't bring your car to a cardiologist to diagnose why the check engine light was on, or why it was making that funny noise. Nutrition is no different; if we're looking for accurate information and advice, we should seek out experts with specific training and experience in the field.

This is not to dismiss other types of expertise that are related to food and nutrition. Traditional home cooks and formally-trained chefs have expertise in preparing tasty, comforting, or exciting food and in keeping food traditions alive. Farmers and home gardeners can share their knowledge about sustainable practices for producing food. Climate scientists can share how our food choices affect the health of the planet. And each of us has our own personal expertise in our own bodies, such as which foods seem to not agree with us, and which make us feel satisfied or energized or connected with our cultures. Knowledge about food can span many areas, but when it comes to information about how eating patterns affect our health, we want to look for someone with training and experience grounded in the science and practice of nutrition.

How to Spot an Expert

If you're seeking a credible expert in nutrition, start by looking for professionals with the following degrees or backgrounds:

- Registered dietitian nutritionist (RD or RDN)
- Professional with advanced degree(s) (MS or PhD) in nutrition
- Physician (MD) with appropriate education and expertise in nutrition

Registered dietitians or professionals with advanced degrees in the field of nutrition are the most credible sources for sound nutrition advice, because their training was most likely grounded in science-based nutrition information and practice. Physicians can also be good sources of nutrition information, depending on their education and background. But be mindful that **medical schools generally offer minimal or no education and training in nutrition,** so most physicians have limited knowledge in this field unless they have sought out specific nutrition training on their own.

Be skeptical of other official-sounding credentials, like "holistic nutrition practitioner," or even just "nutritionist." There are no national standards or regulations for what these titles mean. **In many states, anyone can call themselves a "nutritionist,"** and you could be taking advice from a well-qualified individual with a graduate degree in nutrition or someone who just took a single course or got a mail-order certificate. It's worth taking a closer look at their training and credentials before assuming they have solid expertise in the field.

Keep in mind that every expert, regardless of their level of training and experience, is still human. No person can know everything or understand every perspective, and science is constantly evolving. Just as a single scientific study is never the last word on a scientific question, neither can a single expert have all of the answers. This is why good science reporters interview multiple experts and consider the scientific consensus (based on statements from professional organizations and publications like systematic reviews and meta-analyses) when they report on nutrition and health.

The video below delves further into how we can assess expertise in science and health, including some examples from the COVID-19 pandemic.



VIDEO: "Evaluate Expertise with Mike Caulfield" by CTRL-F, YouTube (May 22, 2020), 4:32.

Careers in Nutrition and Dietetics

There are several pathways to careers in nutrition and dietetics. Here's a quick run-down:

- **Nutrition and Dietetics Technician, Registered (NDTR)** – Earning this credential requires either a two-year associate's degree plus supervised practice in community programs, healthcare or foodservice facilities, or a four-year bachelor's degree from an accredited program. It also requires passing a national exam and completing continuing education to maintain registration. NDTRs often work under the supervision of an RD or RDN in healthcare, foodservice, community, and industry settings.[1]
- **Registered Dietitian Nutritionist (RD or RDN)** – As of January 1, 2024, earning the RD or RDN credential will require a graduate degree (master's or doctoral) in an approved program. The credential also requires completing a supervised internship program and passing a national exam, and continuing education is required to maintain registration.[2] There are many career opportunities for people with the RD and RDN credential, including in clinical practice, such as providing medical nutrition therapy for specific medical diagnoses. RDs and RDNs are also able to bill insurance for their services.
- **Nutritionist** – Unlike the RD/RDN and NDTR credential, there is no national standard for education and training for the title "nutritionist." Some states require individuals to meet certain education and training requirements and be licensed to practice as a nutritionist, but others have no such requirements. Thus, employment opportunities vary by state but are generally more limited (and do not include clinical work in healthcare settings) for those practicing without the RD/RDN or NDTR credential.[3]



Dietitians and nutritionists plan food and nutrition programs, promote healthy eating habits, and recommend dietary modifications. Typically, to work in a clinical setting like a hospital or outpatient setting, the RD/RDN credential is required. For example, a dietitian might teach a patient with hypertension how to follow a lower-sodium diet or formulate special diets for patients being fed through a tube. But there are many types of jobs in nutrition, including in government agencies, companies, education, community, and non-profit organizations. No matter the setting or the clientele, working in the field of nutrition means helping people improve their dietary habits by translating nutritional science into food choices.

Here are some examples of career settings for dietitians and nutritionists:

- Hospitals, clinics, long-term care, or other healthcare facilities, providing patient education and clinical care and tailoring foodservice and dietary recommendations to specific medical conditions and needs.
- Day and residential facilities, such as day care centers and correctional facilities, planning meals and food purchasing.
- Sports nutrition programs for teams, universities, or private clients, providing education and nutrition planning for athletes.
- Food and nutrition-related companies and industries, such as grocery stores and food and supplement companies, working in communications, marketing, public relations, product development, research, or consulting.
- Government agencies, administering federal food programs such as Women, Infants, and Children (WIC), Supplemental Nutrition Assistance Program (SNAP), or the National School Lunch Program (NSLP), coordinating communication campaigns, or creating or analyzing public policy.
- Private practice, providing individual nutrition screenings for clients and guidance on food-related issues, such as planning enjoyable meals, chronic disease prevention, treatment of eating disorders, and weight reduction.
- Community and public health settings, teaching and advising people about healthy eating habits.
- Universities and medical centers, teaching students about nutrition or working as part of research teams to plan and carry out scientific studies.
- Nonprofit organizations, such as anti-hunger organizations, food banks, public health organizations, and activist groups, providing nutrition-related expertise to help meet the organizations' aims.

Whether you pursue nutrition as a career or simply work to improve your own dietary choices, what you are learning in this course is a step toward building your own expertise and being able to seek it out and recognize it in others.

Self-Check:

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CHAPTER OVERVIEW

2: Guidelines For Dietary Guidance

By the end of this chapter, you will be able to:

- Describe US Dietary Guidelines and apply towards building healthy eating patterns
- Define personal nutrient needs according to estimated energy requirements and Dietary Reference Intakes (DRI)
- Identify and apply components of food labels to assess and compare the nutritional value of foods
- Design a healthy eating pattern

2.1: Understanding the Bigger Picture of Dietary Guidelines
2.2: Understanding Dietary Reference Intakes (DRI)
2.3: Discovering Nutrition Facts
2.4: Building Healthy Eating Patterns
2.5: MyPlate Planner
2.6: National Goals for Nutrition and Health- Healthy People 2020

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2.1: Understanding the Bigger Picture of Dietary Guidelines

Learning Objectives

- Describe the major themes of the *2020-2025 Dietary Guidelines for Americans*.

The first US dietary recommendations were set by the National Academy of Sciences in 1941. The recommended dietary allowances (RDA) were first established out of concern that America's overseas World War II troops were not consuming enough daily nutrients to maintain good health. The first Food and Nutrition Board was created in 1941, and in the same year set recommendations for the adequate intakes of caloric energy and eight essential nutrients. These were disseminated to officials responsible for food relief for armed forces and civilians supporting the war effort. Since 1980, the dietary guidelines have been reevaluated and updated every five years by the advisory committees of the US Department of Agriculture (USDA) and the US Department of Health and Human Services (HHS). The guidelines are continually revised to keep up with new scientific evidence-based conclusions on the importance of nutritional adequacy and physical activity to overall health.

While dietary recommendations set prior to 1980 focused only on preventing nutrient inadequacy, the current dietary guidelines have the additional goals of promoting health, reducing chronic disease, and decreasing the prevalence of overweight and obesity.



Figure 2.1.1: Dietary guidelines help people to stay on a healthful track by drawing attention to the overall scope of their diet and lifestyle. © Dreamstime

Why Are Guidelines Needed?

Instituting nation-wide standard policies provides consistency across organizations and allows healthcare workers, nutrition educators, school boards, and elder-care facilities to improve nutrition and subsequently the health of their respective populations. At the same time, the goal of the Dietary Guidelines is to provide informative guidelines that will help any interested person in obtaining optimal nutritional balance and health. The seventh edition of the Dietary Guidelines was released in 2010 and focused mainly on combating the obesity epidemic. USDA Secretary Tom Vilsack said, "The bottom line is that most Americans need to trim their waistlines to reduce the risk of developing diet-related chronic disease. Improving our eating habits is not only good for every individual and family, but also for our country." The 2015 Dietary Guidelines focus on eating patterns, which may be predictive of overall health status and disease risk. The Dietary Guidelines were formulated by the Food and Nutrition Board of the Institute of Medicine (IOM), which has recently changed its name to the National Academy of Medicine (NAM). The 2020–2025 Dietary Guidelines are designed to help Americans eat a healthier diet. Intended for policymakers and health professionals, the 2020 edition of the Dietary Guidelines outlines how people can improve their overall eating patterns — the complete combination of foods and drinks in their diet. The free 2020 edition offers overarching themes about what constitutes a healthy diet, how to shift behaviors to make it possible to follow a healthful diet and a number of Key Recommendations with specific nutritional targets and dietary limits. These guidelines are from the review of thousands of scientific journal articles by a consensus panel consisting of more than two thousand nutrition experts with the overall mission of improving the health of the nation.



Figure 2.1.2: The major theme of the *2020-2025 Dietary Guidelines for Americans* is to make every bite count. © Dreamstime

Major Themes of the *2020-2025 Dietary Guidelines*

The *2020 Dietary Guidelines* consists of four major action steps for the American public to improve their eating habits. It also includes several key recommendations. These four steps are as follows:

1. Follow a healthy dietary pattern at every life stage.
2. Customize and enjoy nutrient-dense food and beverage choices to reflect personal preferences, cultural traditions, and budgetary considerations.
3. Focus on meeting food group needs with nutrient-dense foods and beverages, and stay within calorie limits.
4. Limit foods and beverages higher in added sugars, saturated fat, and sodium, and limit alcoholic beverages.

Below are the highlights for each guideline; however, if you are interested in reading more, visit the USDA website, https://health.gov/dietaryguidelines/2015/guidelines/.

Make every bite count with the Dietary Guidelines for Americans. Here's how:

1. Follow a healthy diet pattern at every life stage.
   At every life stage—infancy, toddlerhood, childhood, adolescence, adulthood, pregnancy, lactation, and older adulthood—it is never too early or too late to eat healthfully.

   - For about the first 6 months of life, exclusively feed infants human milk. Continue to feed infants human milk through at least the first year of life, and longer if desired. Feed infants iron-fortified infant formula during the first year of life when human milk is unavailable. Provide infants with supplemental vitamin D beginning soon after birth.
   - At about 6 months, introduce infants to nutrient-dense complementary foods. Introduce infants to potentially allergenic foods along with other complementary foods. Encourage infants and toddlers to consume a variety of foods from all food groups. Include foods rich in iron and zinc, particularly for infants fed human milk.
   - From 12 months through older adulthood, follow a healthy dietary pattern across the lifespan to meet nutrient needs, help achieve a healthy body weight, and reduce the risk of chronic disease. 1 2 Follow a healthy dietary pattern at every life stage.

1. Customize and enjoy nutrient-dense food and beverage choices to reflect personal preferences, cultural traditions, and budgetary considerations.
   A healthy dietary pattern can benefit all individuals regardless of age, race, or ethnicity, or current health status. The Dietary Guidelines provides a framework intended to be customized to individual needs and preferences, as well as the foodways of the diverse cultures in the United States.

1. Focus on meeting food group needs with nutrient-dense foods and beverages, and stay within calorie limits.
   An underlying premise of the Dietary Guidelines is that nutritional needs should be met primarily from foods and beverages—specifically, nutrient-dense foods and beverages. Nutrient-dense foods provide vitamins, minerals, and other health-promoting components and have no or little added sugars, saturated fat, and sodium. A healthy dietary pattern consists of nutrient-dense forms of foods and beverages across all food groups, in recommended amounts, and within calorie limits. The core elements that make up a healthy dietary pattern include:

- Vegetables of all types—dark green; red and orange; beans, peas, and lentils; starchy; and other vegetables

- Fruits, especially whole fruit
- Grains, at least half of which are whole grain
- Dairy, including fat-free or low-fat milk, yogurt, and cheese, and/or lactose-free versions and fortified soy beverages and yogurt as alternatives
- Protein foods, including lean meats, poultry, and eggs; seafood; beans, peas, and lentils; and nuts, seeds, and soy products
- Oils, including vegetable oils and oils in food, such as seafood and nuts

1. Limit foods and beverages higher in added sugars, saturated fat, and sodium, and limit alcoholic beverages.
   At every life stage, meeting food group recommendations—even with nutrient-dense choices—requires most of a person's daily calorie needs and sodium limits. A healthy dietary pattern doesn't have much room for extra added sugars, saturated fat, or sodium—or for alcoholic beverages. A small amount of added sugars, saturated fat, or sodium can be added to nutrient-dense foods and beverages to help meet food group recommendations, but foods and beverages high in these components should be limited. Limits are:

   - Added sugars—Less than 10 percent of calories per day starting at age 2. Avoid foods and beverages with added sugars for those younger than age 2.
   - Saturated fat—Less than 10 percent of calories per day starting at age 2.
   - Sodium—Less than 2,300 milligrams per day—and even less for children younger than age 14.
   - Alcoholic beverages—Adults of legal drinking age can choose not to drink, or to drink in moderation by limiting intake to 2 drinks or less in a day for men and 1 drink or less in a day for women, when alcohol is consumed. Drinking less is better for health than drinking more. There are some adults who should not drink alcohol, such as women who are pregnant.

How should you develop a healthy eating plan to best achieve your goals of losing weight, gaining weight, or maintaining weight? We will start with some basics and move on to healthy eating patterns. To provide further guidance, several key recommendations are provided. These should be applied in their entirety because of their interconnectedness.

Consume a healthy eating pattern that accounts for all foods and beverages within an appropriate calorie level.

A health heating pattern includes:

- A variety of vegetables from all of the subgroups - dark green, red and orange, legumes (beans and peas), starchy, and other
- Fruits, especially whole fruits
- Grains, at least half of which are whole grains
- Fat-free or low-fat dairy, including milk, yogurt, cheese, and/or fortified soy beverages
- A variety of protein foods, including seafood, lean meats and poultry, eggs, legumes (beans and peas), and nuts, seeds, and soy products
- Oils

The following components of the diet should be limited in order to achieve a healthy eating pattern:

- Consume less than 10 percent of calories per day from added sugars
- Consume less than 10 percent of calories per day from saturated fats
- Consume less than 2,300 milligrams (mg) per day of sodium
- If alcohol is consumed, it should be consumed in moderation - up to one drink per day for women and up to two drinks per day for men - and only by adults of legal drinking age.

Finally, all Americans regardless of age should meet the *Physical Activity Guidelines for Americans*.

Foods and Food Components to Reduce

High consumption of certain foods, such as those high in saturated or trans fat, sodium, added sugars, and refined grains may contribute to the increased incidence of chronic disease. Additionally, excessive consumption of these foods replaces the intake of more nutrient-dense foods.

Table 2.1.1: A Little Less of These, Please

Dietary Constituent	Health Implications	Recommendations
Excess sodium	High blood pressure	Limit intake to 2,300 mg daily

Dietary Constituent	Health Implications	Recommendations
Too much saturated fat	Cardiovascular disease	Limit intake to < 10 percent of total calories
Trans fats	Cardiovascular disease	Minimal, if any consumption
Excess cholesterol	Atherosclerosis	Limit intake to below 300 mg daily
SoFAS (solid fats and added sugars)	Obesity, Type 2 diabetes	Avoid if possible
Too much alcohol	Impaired liver function, impaired motor function	No more than one drink per day for women; No more than two drinks per day for men

The average person consumes 3,400 milligrams of sodium per day, mostly in the form of table salt. The *2020 Dietary Guidelines* recommend that Americans reduce their daily sodium intake to less than 2,300 milligrams. If you are over the age of fifty-one, are African American, or have cardiovascular risk factors, such as high blood pressure or diabetes, sodium intake should be reduced even further to 1,500 milligrams. The *Dietary Guidelines* also recommend that less than 10 percent of calories come from saturated fat, and that fat calories should be obtained by eating foods high in unsaturated fatty acids. Cholesterol intake should be decreased to below 300 milligrams per day and trans fatty acid consumption kept to a bare minimum. The *Dietary Guidelines* stresses the importance of limiting the consumption of foods with refined grains and added sugars, and introduce the new term, SoFAS, which is an acronym for *solid fats and added sugars*, both of which are to be avoided in a healthy diet plan.Nelson, J. and K. Zeratsky. "Dietary Guidelines Connect SoFAS and Weight Gain." Mayo Clinic, *Nutrition-Wise* (blog). August 25, 2010. www.mayoclinic.com/health/die...elines/MY01417. Moreover, if alcohol is consumed, it should be consumed only in moderation, which for women it is not more than one drink per day and for men is not more than two drinks per day. The macronutrients protein, carbohydrates, and fats contribute considerably to total caloric intake. The IOM has made recommendations for different age groups on the percentage of total calories that should be obtained from each macronutrient class (Table 2.1.2).

Table 2.1.2: Recommendations for Macronutrient Intake As Percentage of Total Calories

Age Group	Protein (%)	Carbohydrates (%)	Fat (%)
Children (1–3)	5–20	45–65	30–40
Children and Adolescents (4–18)	10–30	45–65	25–35
Adults (>19)	10–35	45–65	20–35

Source: *2010 Dietary Guidelines*.

Foods and Nutrients to Increase

The typical American diet lacks sufficient amounts of vegetables, fruits, whole grains, and high-calcium foods, causing concern for deficiencies in certain nutrients important for maintaining health. The *2010 Dietary Guidelines* provide the following suggestions on food choices to achieve a healthier diet:

1. Eat a variety of vegetables, especially dark green, red, and orange vegetables.
2. Choose at least half of your grains consumed from whole-grain foods.
3. For dairy products, eat the low-fat versions.
4. Don't get your protein only from red meats; choose instead seafood, poultry, eggs, beans, peas, nuts, seeds, and soy products.
5. Replace butter with oils.
6. Choose foods dense in the nutrients potassium, calcium, and vitamin D.
7. Increase intake of dietary fiber.

The typical American diet lacks sufficient amounts of vegetables, fruits, whole grains, and high-calcium foods, causing concern for deficiencies in certain nutrients important for maintaining health. The Dietary Guidelines provide the following suggestions on food choices to achieve a healthier diet:

Instead of…	Replace with…

Instead of…	Replace with…
Sweetened fruit yogurt	Plain fat-free yogurt with fresh fruit
Whole milk	Low-fat or fat-free milk
Cheese	Low-fat or reduced-fat cheese
Bacon or sausage	Canadian bacon or lean ham
Sweetened cereals	Minimally sweetened cereals with fresh fruit
Apple or berry pie	Fresh apple or berries
Deep-fried French fries	Oven-baked French fries or sweet potato baked fries
Fried vegetables	Steamed or roasted vegetables
Sugary sweetened soft drinks	Seltzer mixed with 100 percent fruit juice
Recipes that call for sugar	Experiment with reducing amount of sugar and adding spices (cinnamon, nutmeg, etc…)

Source: Food Groups. US Department of Agriculture. www.choosemyplate.gov/food-groups/. Updated April 19, 2017. Accessed November 22, 2017.

Building Healthy Eating Patterns

The *2020 Dietary Guidelines* recommend that people make an effort to reduce their caloric consumption, reduce the intake of nutrient-poor foods, and increase the intake of nutrient-dense foods. To accomplish these tasks it is necessary to incorporate moderation and variety. The goal is not only choosing specific foods for your diet, but also the development of a healthy eating pattern. Several studies provide good evidence that certain dietary patterns increase overall health and decrease the risk of chronic disease. The Dietary Approaches to Stop Hypertension trial, or DASH, reports that men and women who consumed more than eight servings per day of fruits and vegetables had lower blood pressures than a control group that consumed under four servings per day of fruits and vegetables.Sacks, F.M, et al., "Effects on Blood Pressure of Reduced Dietary Sodium and the Dietary Approaches to Stop Hypertension (DASH) Diet." *N Engl J Med*. 344, no. 1 (January 2001): 3–10. http://www.nejm.org/doi/full/10.1056/NEJM200101043440101. Other studies investigating the benefits of the DASH diet have also found it to be protective against cardiovascular disease and decrease overall mortality. Another well-known diet is the Mediterranean diet. In general, the Mediterranean diet is described as one that emphasizes fruits, vegetables, whole grains, and nuts, and olive oil as a replacement for butter. Few meats and high-fat dairy products are eaten. Observational studies have linked the Mediterranean diet to reduced cardiovascular disease and decreased mortality. Vegetarian diets, which emphasize many of the same foods as the DASH and Mediterranean diets have also been linked to a decrease in incidences of some chronic diseases.



Figure 2.1.3: Fresh vegetables and olive oil are examples of foods emphasized in the DASH and Mediterranean diets. © Thinkstock

Key Takeaways

- US dietary guidelines are based on evolving scientific evidence and are updated every five years. The goals of the *2015-2020 Dietary Guidelines* are to prevent nutrient inadequacy, promote health, reduce chronic disease, and decrease the prevalence of

overweight and obesity.

- To have a healthy eating pattern, reduce the intake of sodium, saturated and trans fats, cholesterol, added sugars, and refined grains. Increase the consumption of fruits, vegetables, low-fat dairy products, dietary fiber, and oils.
- Healthy eating patterns prevent chronic disease and provide nutrient adequacy.

Discussion Starter

1. Discuss with your classmates suggestions from the *2015-2020 Dietary Guidelines* that you should incorporate into your diet. How can you align your personal dietary goals with these recommendations?

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2.2: Understanding Dietary Reference Intakes (DRI)

Learning Objectives

- Use the Dietary Reference Intakes to determine daily nutrient recommendations.

Dietary Reference Intakes (DRI) are the recommendation levels for specific nutrients and consist of a number of different types of recommendations. This DRI system is used in both the United States and Canada.

Dietary Reference Intakes: A Brief Overview

The most recent recommendations from the Food and Nutrition Board are the "Dietary Reference Intakes" (DRI). The DRI include 4 sets of standards:

- **Recommended Dietary Allowances (RDA)**: average daily level of intake sufficient to meet the nutrient requirements of nearly all (97%-98%), healthy people.
- **Adequate Intakes (AI)**: established when evidence is insufficient to develop an RDA and is set at a level assumed to ensure nutritional adequacy.
- **Tolerable Upper Intake Levels (UL)**: maximum daily intake unlikely to cause adverse health effects.
- **Estimated Average Requirements (EARs)**: expected to satisfy the needs of 50% of the people in that age group based on a review of the scientific literature.

The DRIs are not minimum or maximum nutritional requirements and are not intended to fit everybody. They are to be used as guides only for the majority of the healthy population. https://ods.od.nih.gov/Health_Information/Dietary_Reference_Intakes.aspx

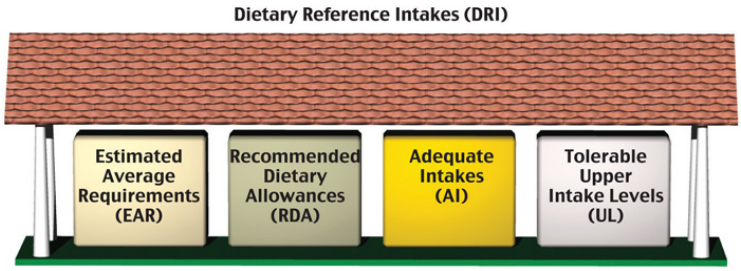


Figure 2.2.1: The DRIs are inclusive of all four reference values. © Networkgraphics

DRIs are important not only to help the average person determine whether their intake of a particular nutrient is adequate, they are also used by health-care professionals and policy makers to determine nutritional recommendations for special groups of people who may need help reaching nutritional goals. This includes people who are participating in programs such as the Special Supplemental Food Program for Women, Infants, and Children. The DRI is not appropriate for people who are ill or malnourished, even if they were healthy previously.

Determining Dietary Reference Intakes

Each DRI value is derived in a different way. See below for an explanation of how each is determined:

1. **Estimated Average Requirements.** The EAR for a nutrient is determined by a committee of nutrition experts who review the scientific literature to determine a value that meets the requirements of 50 percent of people in their target group within a given life stage and for a particular sex. The requirements of half of the group will fall below the EAR and the other half will be above it. It is important to note that, for each nutrient, a specific bodily function is chosen as the criterion on which to base the EAR. For example, the EAR for calcium is set using a criterion of maximizing bone health. Thus, the EAR for calcium is set at a point that will meet the needs, with respect to bone health, of half of the population. EAR values become the scientific foundation upon which RDA values are set.
2. **Recommended Daily Allowances.** Once the EAR of a nutrient has been established, the RDA can be mathematically determined. While the EAR is set at a point that meets the needs of half the population, RDA values are set to meet the needs of the vast majority (97 to 98 percent) of the target healthy population. It is important to note that RDAs are not the same thing as individual nutritional requirements. The actual nutrient needs of a given individual will be different than the RDA. However, since we know that 97 to 98 percent of the population's needs are met by the RDA, we can assume that if a person is consuming

the RDA of a given nutrient, they are most likely meeting their nutritional need for that nutrient. The important thing to remember is that the RDA is meant as a *recommendation* and meeting the RDA means it is very likely that you are meeting your actual *requirement* for that nutrient.

Understanding the Difference

There is a distinct difference between a requirement and a recommendation. For instance, the DRI for vitamin D is a *recommended* 600 international units each day. However, in order to find out your true personal *requirements* for vitamin D, a blood test is necessary. The blood test will provide an accurate reading from which a medical professional can gauge your required daily vitamin D amounts. This may be considerably more or less than the DRI, depending on what your level actually is.

1. **Adequate Intake.** AIs are created for nutrients when there is insufficient consistent scientific evidence to set an EAR for the entire population. As with RDAs, AIs can be used as nutrient-intake goals for a given nutrient. For example, there has not been sufficient scientific research into the particular nutritional requirements for infants. Consequently, all of the DRI values for infants are AIs derived from nutrient values in human breast milk. For older babies and children, AI values are derived from human milk coupled with data on adults. The AI is meant for a healthy target group and is not meant to be sufficient for certain at-risk groups, such as premature infants.
2. **Tolerable Upper Intake Levels.** The UL was established to help distinguish healthful and harmful nutrient intakes. Developed in part as a response to the growing usage of dietary supplements, ULs indicate the highest level of continuous intake of a particular nutrient that may be taken without causing health problems. When a nutrient does not have any known issue if taken in excessive doses, it is not assigned a UL. However, even when a nutrient does not have a UL it is not necessarily safe to consume in large amounts.

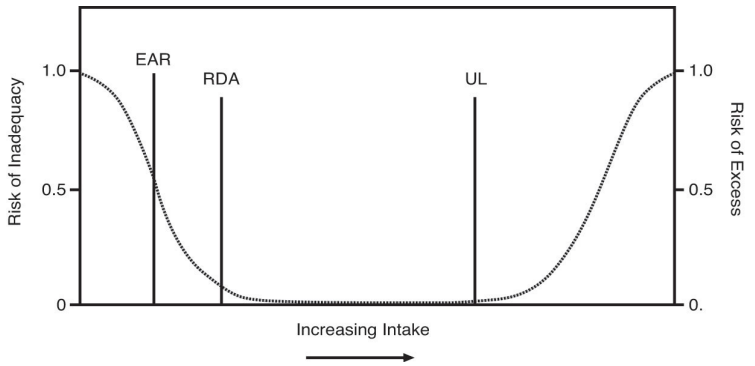


Figure 2.2.2: DRI Graph. This graph illustrates the risks of nutrient inadequacy and nutrient excess as we move from a low intake of a nutrient to a high intake. Starting on the left side of the graph, you can see that when you have a very low intake of a nutrient, your risk of nutrient deficiency is high. As your nutrient intake increases, the chances that you will be deficient in that nutrient decrease. The point at which 50 percent of the population meets their nutrient need is the EAR, and the point at which 97 to 98 percent of the population meets their needs is the RDA. The UL is the highest level at which you can consume a nutrient without it being too much—as nutrient intake increases beyond the UL, the risk of health problems resulting from that nutrient increases. Source: Institute of Medicine. © 2012 National Academy of Sciences. All Rights Reserved. www.iom.edu.

3. **Acceptable Macronutrient Distribution Ranges.** The Acceptable Macronutrient Distribution Range (AMDR) is the calculated range of how much energy from carbohydrates, fats, and protein is recommended for a healthy diet. People who do not reach the AMDRs for their target group increase their risk of developing health complications.

Table 2.7: AMDR Values for Adults

Nutrient	Value (percentage of Calories)
Fat	20.0–35.0
Carbohydrate	45.0–65.0
Protein	10.0–35.0
Polyunsaturated fatty acids	5.0–10.0
Linolenic acid	0.6–1.2

Source: Food and Nutrition Board of the Institute of Medicine. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids. (Washington, DC: National Academies Press, 2002).

Tips for Using the Dietary Reference Intakes to Plan Your Diet

You can use the DRIs to help assess and plan your diet. Keep in mind when evaluating your nutritional intake that the values established have been devised with an ample safety margin and should be used as guidance for optimal intakes. Also, the values are meant to assess and plan average intake over time; that is, you don't need to meet these recommendations every single day—meeting them on average over several days is sufficient.

Key Takeaways

- Nutrient-intake recommendations set for healthy people living in the United States and Canada are known as Dietary Reference Intakes.
- The DRIs includes the AI, EAR, RDA, and UL for micronutrients and the AMDR ranges for energy-yielding macronutrients. The DRI provide a set of standards for researchers and government policy-makers, and specifies nutrient consumption guidelines for individuals.

Discussion Starter

1. Why do you think it is important for the government to set the DRI standards? How will you use this information for your personal dietary choices?

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2.3: Discovering Nutrition Facts

The Labels on Your Food

Understanding the significance of dietary guidelines and how to use DRIs in planning your nutrient intakes can make you better equipped to select the right foods the next time you go to the supermarket.

In the United States, the Nutrition Labeling and Education Act (NLEA) passed in 1990 and came into effect in 1994. In Canada, mandatory labeling came into effect in 2005. As a result, all packaged foods sold in the United States and Canada must have nutrition labels that accurately reflect the contents of the food products. There are several mandated nutrients and some optional ones that manufacturers or packagers include.

In May, 2016 a new Nutrition Facts label for packaged foods, beverages and dietary supplements was announced. This label reflects new scientific information and will make it easier for consumers to make informed food choices. Some of the changes made to the label include:

- Increased type size for “Calories,” “servings per container,” and “Serving size.”
- Bolded type for the number of calories and the “Serving size.”
- Actual amounts of vitamin D, calcium, iron, and potassium (in addition to the Daily Value amounts) are required to be listed. Vitamins A and C are now voluntary.
- Improved footnote to better explain that the Daily Value is based on a 2,000 calories a day diet.
- Changed “Sugars” to “Total Sugars”. Added “Includes” to clarify that “added sugars” is a subcomponent of “total sugars.”
- “Added sugars” in grams and percent Daily Value are required to be listed due to scientific data the impact of added sugars on caloric intake. Added sugars are either added during processing of foods, or are packaged as such, and include items such as: syrups, maltose, and invert sugar.
- “Total Fat,” “Saturated Fat,” “Trans Fat,” “Cholesterol,” “Total Carbohydrates” are still required on the label.
- “Calories from fat” has been removed because the type of fat is important.
- Updated values for sodium, dietary fiber, and vitamin D (which are all required on the label) based on newer scientific research.
- Updated serving sizes that reflect how much consumers are more likely eating today.
- Some packages with serving sizes between one and two are required to be labelled as one serving since most consumers will likely eat it in one sitting
- Dual columns for certain products that are larger than a single serving but could be consumed in one sitting will indicate “per serving” and “per package” amounts.
- Percent DV of some nutrients were updated due to newly available scientific data.
- The compliance date for manufacturers to adopt the new label was extended to January 1, 2020. Manufacturers with less than $10 million in annual food sales will have until January 1, 2021.

Reading the Label

The first part of the Nutrition Facts panel gives you information on the serving size and how many servings are in the container. For example, a label on a box of crackers might tell you that twenty crackers equals one serving and that the whole box contains 10 servings. All other values listed thereafter, from the calories to the dietary fiber, are based on this one serving. On the panel, the serving size is followed by the number of calories and then a list of selected nutrients. You will also see “Percent Daily Value” on the far right-hand side. This helps you determine if the food is a good source of a particular nutrient or not.

The Daily Value (DV) represents the recommended amount of a given nutrient based on the RDA of that nutrient in a 2,000-kilocalorie diet. The DV was updated as part of the new nutrition facts label announced in May 2016. The updated DV applies to packaged food, beverages and dietary supplements that contain ingredients with a DV. The percentage of Daily Value (percent DV) represents the proportion of the total daily recommended amount that you will get from one serving of the food. For example, in the older food label in Figure 12.2 the percent DV of calcium for one serving of macaroni-and-cheese is 20 percent, which means that one serving of macaroni and cheese provides 20 percent of the daily recommended calcium intake. Since the DV for calcium is 1,300 milligrams, the food producer determined the percent DV for calcium by taking the calcium content in milligrams in each serving, and dividing it by 1,300 milligrams, and then multiplying it by 100 to get it into percentage format. Whether you consume 2,000 calories per day or not you can still use the percent DV as a target reference.

Generally, a percent DV of 5 is considered low and a percent DV of 20 is considered high. This means, as a general rule, for fat, saturated fat, trans fat, cholesterol, or sodium, look for foods with a low percent DV. Alternatively, when concentrating on essential mineral or vitamin intake, look for a high percent DV. To figure out your fat allowance remaining for the day after consuming one serving of macaroni-and-cheese, look at the percent DV for fat, which is 18 percent, and subtract it from 100 percent. To know this amount in grams of fat, read the footnote of the food label to find that the recommended maximum amount of fat grams to consume per day for a 2,000 kilocalories per day diet is 65 grams. Eighteen percent of sixty-five equals about 12 grams. This means that 53 grams of fat are remaining in your fat allowance. Remember, to have a healthy diet the recommendation is to eat less than this amount of fat grams per day, especially if you want to lose weight.

Table 2.3.1: Updated DVs Based on a Caloric Intake of 2,000 Calories (For Adults and Children Four or More Years of Age)

Nutrient	Original DV	Updated DV[1]
Total Fat	65 g	78 g
Saturated Fat	20 g	20 g
Cholesterol	300 mg	300 mg
Sodium	2400 mg	2300 mg
Potassium	3500 mg	4700 mg
Total Carbohydrate	300 g	275 g
Dietary Fiber	25 g	28 g
Protein	50 g	50 g
Vitamin A	5000 IU	900 µg RAE[2]
Vitamin C	60 mg	90 mg
Calcium	1000 mg	1300 mg
Iron	18 mg	18 mg
Vitamin D	400 IU	20 µg[2]
Vitamin E	30 IU	15 mg alpha-tocopherol[2,3]
Vitamin K	80 µg	120 µg
Thiamin	1.5 mg	1.2 mg
Riboflavin	1.7 mg	1.3 mg
Niacin	20 mg	16 mg NE[1]

Nutrient	Original DV	Updated DV[1]
Vitamin B6	2 mg	1.7 mg
Folate/Folic Acid	400 µg	400 µg DFE[2,4]
Vitamin B12	6 µg	2.4 µg
Biotin	300 µg	30 µg
Pantothenic Acid	10 mg	5 mg
Phosphorus	1000 mg	1250 mg
Iodine	150 µg	150 µg
Magnesium	400 mg	420 mg
Zinc	15 mg	11 mg
Selenium	70 µg	55 µg
Copper	2 mg	0.9 mg
Manganese	2 mg	2.3 mg
Chromium	120 µg	35 µg
Molybdenum	75 µg	45 µg
Chloride	3400 mg	2300 mg
	New Daily Values	
Nutrient	Original DV	Updated DV[1]
Added sugars	–	50 g
Choline	–	550 mg

[1] %DV in the nutrition facts label will be reflected on January 1, 2020. Manufacturers with less than $10 million in annual food sales have until January 1, 2021 to comply.
[2] Indicates a unit of measure change.
[3] The DV decrease for vitamin E applies for natural forms of vitamin E in foods/supplements but not for the synthetic form. Food/supplement containing only the synthetic form of vitamin E, the DV is increased.
[4] The DV decrease for folate/folic acid applies only to foods/supplements with folic acid or a mixture of folic acid and naturally occuring folate. The original and updated DV is the same for foods/supplements containing only naturally occurring folate.

Units of Measure Key:
g = grams
mg = milligrams
µg = micrograms
mg NE = milligrams of niacin equivalents
µg DFE = micrograms of dietary folate equivalents
µg RAE = micrograms of retinol activity equivalents
IU = international units

Source: FDA. (2020). Daily Value on the New Nutrition and Supplement Facts Labels. https://www.fda.gov/food/new-nutriti...t-facts-labels

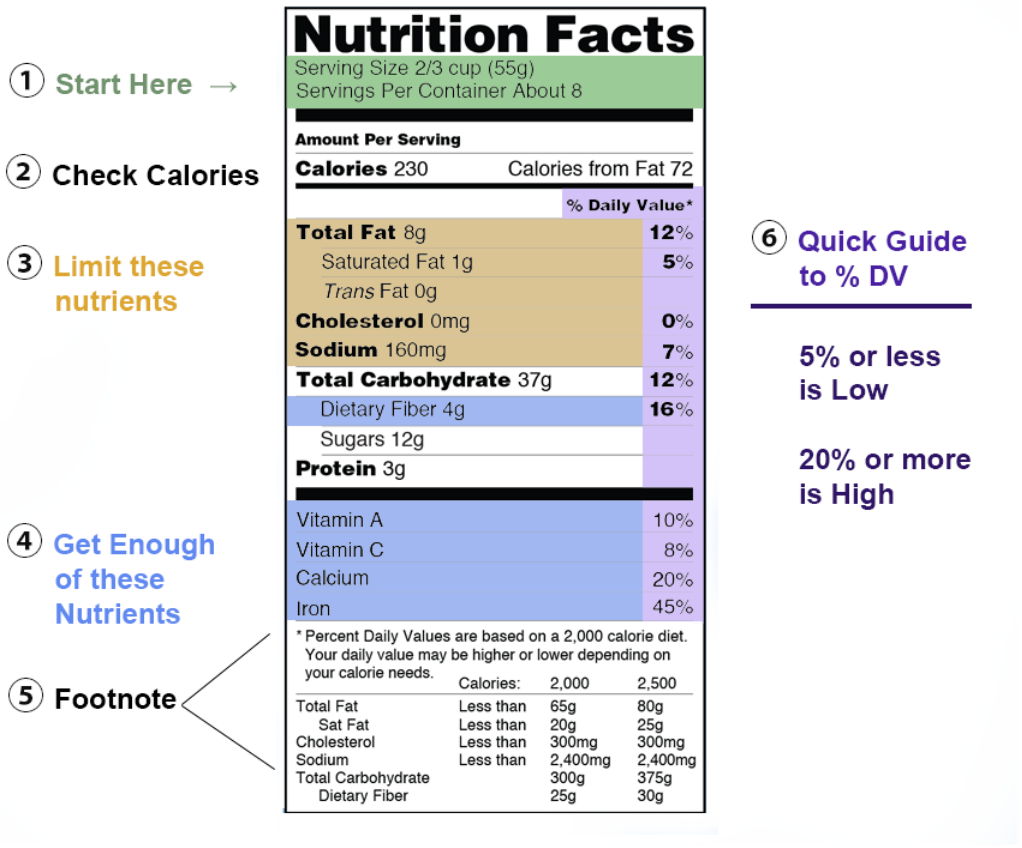


Figure 2.3.1: Reading the Older Nutrition Label. Guide for reading older Nutrition Facts label

Adapted from: Image by FDA/Side by Side Comparison of Old and New Nutrition Facts Label

Of course, this is a lot of information to put on a label and some products are too small to accommodate it all. In the case of small packages, such as small containers of yogurt, candy, or fruit bars, permission has been granted to use an abbreviated version of the Nutrition Facts panel. To learn additional details about all of the information contained within the Nutrition Facts panel, see the following website: www.fda.gov/Food/ResourcesFor.../ucm274593.htm

Original vs. New Format – Infographics to Help Understand the Changes



Figure 2.3.2: The Original vs. New Nutrition Facts Label. Image by FDA/Side by Side Comparison of Old and New Nutrition Facts Label



Figure 2.3.3: The New Nutrition Facts Label. Image by FDA/ Changes to the Nutrition Facts Label



Figure 2.3.4: Food Serving Sizes. Image by FDA/ Changes to the Nutrition Facts Label

Source: https://www.fda.gov/Food/GuidanceReg.../ucm385663.htm

There are other types of information that are required by law to appear somewhere on the consumer packaging. They include[1]:

- Name and address of the manufacturer, packager, or distributor
- Statement of identity, what the product actually is
- Net contents of the package: weight, volume, measure, or numerical count
- Ingredients, listed in descending order by weight

The Nutrition Facts panel provides a wealth of information about the nutritional content of the product. The information also allows shoppers to compare products. Because the serving sizes are included on the label, you can see how much of each nutrient is in each serving to make the comparisons. Knowing how to read the label is important because of the way some foods are presented. For example, a bag of peanuts at the grocery store may seem like a healthy snack to eat on the way to class. But have a look at that label. Does it contain one serving, or multiple servings? Unless you are buying the individual serving packages, chances are the bag you picked up is at least eight servings, if not more.

According to the 2010 health and diet survey released by the FDA, 54 percent of first-time buyers of a product will check the food label and will use this information to evaluate fat, calorie, vitamin, and sodium content[2]. The survey also notes that more Americans are using food labels and are showing an increased awareness of the connection between diet and health. Having reliable food labels is a top priority of the FDA, which has a new initiative to prepare guidelines for the food industry to construct “front of package” labeling that will make it even easier for Americans to choose healthy foods. Stay tuned for the newest on food labeling by visiting the FDA website: https://www.fda.gov/food/nutrition-e...on-facts-label

Claims on Labels

In addition to mandating nutrients and ingredients that must appear on food labels, any nutrient content claims must meet certain requirements. For example, a manufacturer cannot claim that a food is fat-free or low-fat if it is not, in reality, fat-free or low-fat. Low-fat indicates that the product has three or fewer grams of fat; low salt indicates there are fewer than 140 milligrams of sodium, and low-cholesterol indicates there are fewer than 20 milligrams of cholesterol and two grams of saturated fat[3]. See Table 2.3.2 for some examples.

Table 2.3.2: Common Label Terms Defined

Term	Explanation

Term	Explanation
Lean	Fewer than a set amount of grams of fat for that particular cut of meat or seafood
High, Rich In, or Excellent Source Of	Contains 20% or more of the nutrient's DV
Good source, Contains or Provides	Contains 10 to 19% of the nutrient's DV
Light/lite	Contains ⅓ fewer calories or 50% less fat; if more than half of calories come from fat, then fat content must be reduced by 50% or more
Organic[1]	Contains 95% certified organic ingredients

[1] The term "Organic" is regulated by the USDA and appears as a USDA Organic Seal in the front of packaged food products, beverages and dietary supplements. Source:AMS, USDA. https://www.ams.usda.gov/about-ams/p...rganic-program. Food Labeling Guide. US Food and Drug Administration. http://www.fda.gov. Updated February 10, 2012. Accessed November 28, 2017.



Figure 2.3.5: Image by USDA/ USDA Organic

Health Claims

Often we hear news of a particular nutrient or food product that contributes to our health or may prevent disease. A health claim is a statement that links a particular food with a reduced risk of developing disease. Implied health claims include the use of symbols, statements and other forms of communication that suggest a relationship between a food substance and disease reduction. As such, health claims such as "Three grams of soluble fiber from oatmeal daily in combination with a diet low in cholesterol and saturated fat may reduce the risk of heart disease," must be evaluated by the FDA before it may appear on packaging. Prior to the passage of the NLEA products that made such claims were categorized as drugs and not food. All health claims must be substantiated by scientific evidence in order for it to be approved and put on a food label. To avoid having companies making false claims, laws also regulate how health claims are presented on food packaging. In addition to the claim being backed up by scientific evidence, it may never claim to diagnose, mitigate, cure or treat the disease. For a detailed list of approved health claims, visit: https://www.fda.gov/food/food-labeli...t-ssa-standard

Qualified Health Claims

While health claims must be backed up by hard scientific evidence, qualified health claims have supportive evidence, which is not as definitive as with health claims. The evidence may suggest that the food or nutrient is beneficial. Qualified health claims can be made for both dietary supplements and conventional food items. Wording for this type of claim may look like this: "Supportive but not conclusive research shows that consumption of EPA and DHA omega-3 fatty acids may reduce the risk of coronary artery disease. One serving of [name of food] provides [X] grams of EPA and DHA omega-3 fatty acids. [See nutrition information for total fat, saturated fat, and cholesterol content.] Dietary supplements may declare the amount of EPA and DHA per serving in their section for "supplement facts" instead.

Soure: FDA (2013). Guidance for Industry: Food Labeling Guide. http://www.fda.gov/foodlabelingguide

Structure/Function Claims

Some companies claim that certain foods and nutrients have benefits for health even though no scientific evidence exists. In these cases, food labels are permitted to claim that you may benefit from the food because it may boost your immune system, for example. There may not be claims of diagnosis, cures, treatment, or disease prevention, and there must be a disclaimer that the FDA has not evaluated the claim[4].

Allergy Warnings

Food manufacturers are required by the FDA to list on their packages if the product contains any of the eight most common ingredients that cause food allergies. These eight common allergens are as follows: milk, eggs, peanuts, tree nuts, fish, shellfish, soy, and wheat. (More information on these allergens will be discussed in Chapter 18 "Nutritional Issues".) The FDA does not require warnings that cross contamination may occur during packaging, however most manufacturers include this advisory as a courtesy. For instance, you may notice a label that states, "This product is manufactured in a factory that also processes peanuts." If you have food allergies, it is best to avoid products that may have been contaminated with the allergen.

When Enough Is Enough

Estimating Portion Size

Have you ever heard the expression, "Your eyes were bigger than your stomach?" This means that you thought you wanted a lot more food than you could actually eat. Amounts of food can be deceiving to the eye, especially if you have nothing to compare them to. It is very easy to heap a pile of mashed potatoes on your plate, particularly if it is a big plate, and not realize that you have just helped yourself to three portions instead of one.

The food industry makes following the 2015 Dietary Guidelines a challenge. In many restaurants and eating establishments, portion sizes have increased, use of solid fats and added sugars (SoFAS) has increased, and consequently the typical meal contains more calories than it used to. In addition, our sedentary lives make it difficult to expend enough calories during normal daily activities. In fact, more than one-third of adults are not physically active at all.

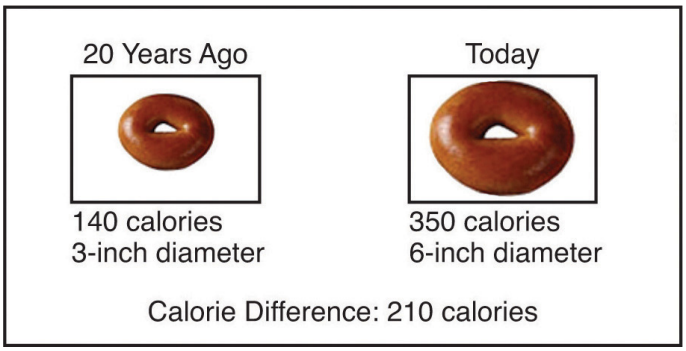


Figure 2.3.6: A Comparison of Serving Sizes. Image by FDA/ Portion Distortion

Source: National Heart, Lung, and Blood Institute Obesity Education Initiative. (2015). Do you know how food portions have changed in 20 years? https://www.nhlbi.nih.gov/health/edu...uments/PD1.pdf

As food sizes and servings increase it is important to limit the portions of food consumed on a regular basis. Dietitians have come up with some good hints to help people tell how large a portion of food they really have. Some suggest using common items such as a deck of cards while others advocate using your hand as a measuring rule[5].

Table 2.3.3: Determining Food Portions

Food Product	Amount	Object Comparison	Hand Comparison
Pasta, rice	½ c.	Tennis ball	Cupped hand
Fresh vegetables	1 c.	Baseball	–
Cooked vegetables	½ c.	–	Cupped hand
Meat, poultry, fish	3 oz.	Deck of cards	Palm of your hand
Milk or other beverages	1 c.	Fist	–

Food Product	Amount	Object Comparison	Hand Comparison
Salad dressing	1 Tbsp.	Thumb	–
Oil	1 tsp.	Thumb tip	–

Everyday Connections

If you wait many hours between meals, there is a good chance you will overeat. To refrain from overeating try consuming small meals at frequent intervals throughout the day as opposed to two or three large meals. Eat until you are satisfied, not until you feel "stuffed." Eating slowly and savoring your food allows you to both enjoy what you eat and have time to realize that you are full before you get overfull. Your stomach is about the size of your fist but it expands if you eat excessive amounts of food at one sitting. Eating smaller meals will diminish the size of your appetite over time so you will feel satisfied with smaller amounts of food.

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2.4: Building Healthy Eating Patterns

Helping People Make Healthy Choices

It is not just ourselves, the food industry, and federal government that shape our choices of food and physical activity, but also our sex, genetics, disabilities, income, religion, culture, education, lifestyle, age, and environment. All of these factors must be addressed by organizations and individuals that seek to make changes in dietary habits. The socioeconomic model incorporates all of these factors and is used by health-promoting organizations, such as the USDA and the HHS to determine multiple avenues through which to promote healthy eating patterns, to increase levels of physical activity, and to reduce the risk of chronic disease for all Americans. Lower economic prosperity influences diet specifically by lowering food quality, decreasing food choices, and decreasing access to enough food. The USDA reports that an estimated 12.3 percent or 15.6 million Americans were food insecure, meaning they had insufficient funds to feed all family members at least some time during the year in 2016[1].

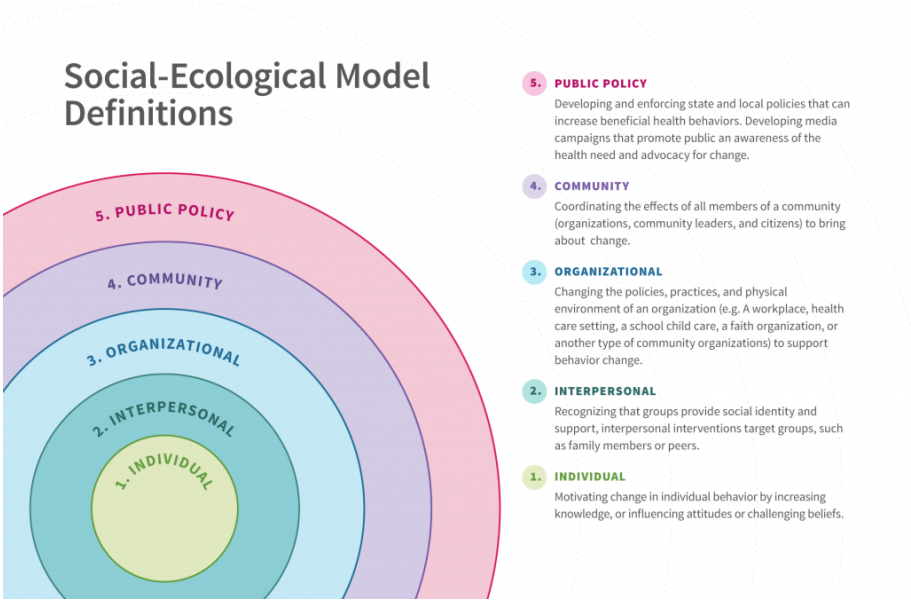


Figure 2.4.1: Social-Ecological Model. Image by Allison Calabrese / CC BY 4.0

Recommendations for Optimal Health

For many years, the US government has been encouraging Americans to develop healthful dietary habits. In 1992 the Food Pyramid was introduced, and in 2005 it was updated. This was the symbol of healthy eating patterns for all Americans. However, some felt it was difficult to understand, so in 2011, the pyramid was replaced with MyPlate.

The MyPlate program uses a tailored approach to give people the needed information to help design a healthy diet. The plate is divided according to the amount of food and nutrients you should consume for each meal. Each food group is identified with a different color, showing the food variety that all plates must have. Aside from educating people about the type of food that is best to support optimal health, the new food plan offers the advice that it is okay to enjoy food, just eat a diverse diet and in moderation[2].

Everyday Connections

Interested in another reliable source for nutrition and health information? The “Got Nutrients?” website highlights the importance of meeting essential nutrient needs in order to maintain optimum health. This website, geared for those interested in nutrition, fitness, and health, posts short daily nutrition and health messages. Each short “Daily Tip” includes links to both a popular article and to a related scientific resource. For more information about “Got Nutrients?” visit, http://www.gotnutrients.net. To receive the “Daily Tips” by email, visit http://www.gotnutrients.net/email_alerts/subscribe.cfm



Figure 2.4.2: Image by Got Nutrients?/ Got Nutrients website

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2.5: MyPlate Planner

Estimating portions can be done using the MyPlate Planner. Recall that the MyPlate symbol is divided according to how much of each food group should be included with each meal. Note the MyPlate

Planner Methods of Use:

- Fill half of your plate with vegetables such as carrots, broccoli, salad, and fruit.
- Fill one-quarter of your plate with lean meat, chicken, or fish (about 3 ounces)
- Fill one-quarter of your plate with a whole grain such as ⅓ cup rice
- Choose one serving of dairy
- Add margarine or oil for preparation or addition at the table

Building a Healthy Plate: Choose Nutrient-Dense Foods

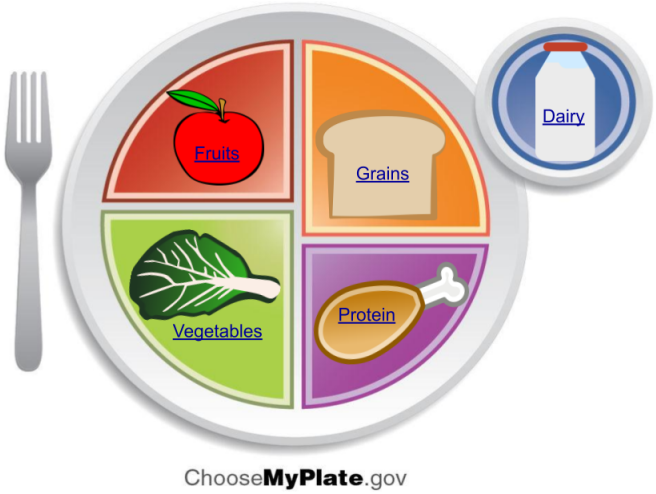


Figure 2.5.1: Image by Allison Calabrese / CC BY 4.0

Click on the different food groups listed to view their food gallery:

- Fruits
- Grains
- Dairy
- Vegetables
- Protein

Planning a healthy diet using the MyPlate approach is not difficult. According to the icon, half of your plate should have fruits and vegetables, one-quarter should have whole grains, and one-quarter should have protein. Dairy products should be low-fat or non-fat. The ideal diet gives you the most nutrients within the fewest calories. This means choosing nutrient-rich foods.

Fill half of your plate with red, orange, and dark green vegetables and fruits, such as kale, bok choy, kalo (taro), tomatoes, sweet potatoes, broccoli, apples, mango, papaya , guavas, blueberries, and strawberries in main and side dishes. Vary your choices to get the benefit of as many different vegetables and fruits as you can. You may choose to drink fruit juice as a replacement for eating fruit. (As long as the juice is 100 percent fruit juice and only half your fruit intake is replaced with juice, this is an acceptable exchange.) For snacks, eat fruits, vegetables, or unsalted nuts.

Fill a quarter of your plate with whole grains such as 100 percent whole-grain cereals, breads, crackers, rice, and pasta. Half of your daily grain intake should be whole grains. Read the ingredients list on food labels carefully to determine if a food is comprised of whole grains.

Select a variety of protein foods to improve nutrient intake and promote health benefits. Each week, be sure to include a nice array of protein sources in your diet, such as nuts, seeds, beans, legumes, poultry, soy, and seafood. The recommended consumption

amount for seafood for adults is two 4-ounce servings per week. When choosing meat, select lean cuts. Be conscious to prepare meats using little or no added saturated fat, such as butter.

If you enjoy drinking milk or eating milk products, such as cheese and yogurt, choose low-fat or nonfat products. Low-fat and nonfat products contain the same amount of calcium and other essential nutrients as whole-milk products, but with much less fat and calories. Calcium, an important mineral for your body, is also available in lactose-free and fortified soy beverage and rice beverage products. You can also get calcium in vegetables and other fortified foods and beverages.

Oils are essential for your diet as they contain valuable essential fatty acids, but the type you choose and the amount you consume is important. Be sure the oil is plant-based rather than based on animal fat. You can also get oils from many types of fish, as well as avocados, and unsalted nuts and seeds. Although oils are essential for health they do contain about 120 calories per tablespoon. It is vital to balance oil consumption with total caloric intake. The Nutrition Facts label provides the information to help you make healthful decisions.

In short, substituting vegetables and fruits in place of foods high in added sugars, saturated fats, and sodium is a good way to make a nutrient-poor diet healthy again. Vegetables are full of nutrients and antioxidants that help promote good health and reduce the risk for developing chronic diseases such as stroke, heart disease, high blood pressure, Type 2 diabetes, and certain types of cancer. Starting with these small shifts in your diet as mentioned above will boost your overall health profile.

Discretionary Calories

When following a balanced, healthful diet with many nutrient-dense foods, you may consume enough of your daily nutrients before you reach your daily calorie limit. The remaining calories are discretionary (to be used according to your best judgment). To find out your discretionary calorie allowance, add up all the calories you consumed to achieve the recommended nutrient intakes and then subtract this number from your recommended daily caloric allowance. For example, someone who has a recommended 2,000-calorie per day diet may eat enough nutrient-dense foods to meet requirements after consuming only 1,814 calories. The remaining 186 calories are discretionary. See Table 12.5. These calories may be obtained from eating an additional piece of fruit, adding another teaspoon of olive oil on a salad or butter on a piece of bread, adding sugar or honey to cereal, or consuming an alcoholic beverage[1].

The amount of discretionary calories increases with physical activity level and decreases with age. For most physically active adults, the discretionary calorie allowance is, at most, 15 percent of the recommended caloric intake. By consuming nutrient-dense foods, you afford yourself a discretionary calorie allowance.

Table 2.5.1: Sample Menu Plan Containing 2,000 Calories

Meal	Calories	Total Meal/Snack Calories
Breakfast		
1 scrambled egg	92	
with sliced mushrooms and spinach	7	
½ whole-wheat muffin	67	
1 tsp. margarine-like spread	15	
1 orange	65	
8 oz. low-sodium tomato juice	53	299
Snack		
6 oz. fat-free flavored yogurt	100	
with ½ c. raspberries	32	132
Lunch		
1 sandwich on pumpernickel bread	160	
with smoked turkey deli meat,	30	

Meal	Calories	Total Meal/Snack Calories
4 slices tomato	14	
2 lettuce leaves	3	
1 tsp. mustard	3	
1 oz. baked potato chips	110	
½ c. blueberries, with 1 tsp. sugar	57	
8 oz. fat-free milk	90	467
Snack		
1 banana	105	
7 reduced-fat high-fiber crackers	120	225
Dinner		
1 c. Greek salad (tomatoes, cucumbers, feta)	150	
with 5 Greek olives,	45	
with 1.5 tsp. olive oil	60	
3 oz. grilled chicken breast	150	
½ c. steamed asparagus	20	
with 1 tsp. olive oil,	40	
with 1 tsp. sesame seeds	18	
½ c. cooked wild rice	83	
with ½ c. chopped kale	18	
1 whole-wheat dinner roll	4	
with 1 tsp. almond butter	33	691
(Total calories from all meals and snacks = 1,814)		
Discretionary calorie allowance: 186		

(Total calories from all meals and snacks = 1,814) Discretionary calorie allowance: 186

Healthy Eating Index

To assess whether the American diet is conforming to the Dietary Guidelines, the Center for Nutrition Policy and Promotion (CNPP), a division of the USDA, uses a standardized tool called the Healthy Eating Index (HEI)[2].

The first HEI was developed in 1995 and revised in 2006. This tool is a simple scoring system of dietary components. The data for scoring diets is taken from national surveys of particular population subgroups, such as children from low-income families or Americans over the age of sixty-five. Diets are broken down into several food categories including milk, whole fruits, dark green and orange vegetables, whole grains, and saturated fat, and then a score is given based on the amount consumed. For example, a score of ten is given if a 2,000-kilocalorie diet includes greater than 2.6 cups of milk per day. If less than 10 percent of total calories in a diet are from saturated fat, a score of eight is given. All of the scores are added up from the different food categories and the diets are given a HEI score. Using this standardized diet-assessment tool at different times, every ten years for instance, the CNPP can determine if the eating habits of certain groups of the American population are getting better or worse. The HEI tool provides

the federal government with information to make policy changes to better the diets of American people. For more information on the HEI, visit this website: www.cnpp.usda.gov/healthyeatingindex.htm.

The Whole Nutrient Package versus Disease

A healthy diet incorporating seven or more servings of fruits and vegetables has been shown in many scientific studies to reduce cardiovascular disease and overall deaths attributable to cancer. The WHO states that insufficient fruit and vegetable intake is linked to approximately 14 percent of gastrointestinal cancer deaths, about 11 percent of heart attack deaths, and 9 percent of stroke deaths globally[3].

The WHO estimates that, overall, 2.7 million deaths could be avoided annually by increasing fruit and vegetable intake. These preventable deaths place an economic, social, and mental burden on society. This is why, in 2003, the WHO and the Food and Agricultural Organization of the United Nations launched a campaign to promote fruit and vegetable intake worldwide.

Antioxidant Variety in Food Provides Health Benefits

Not only has the several-billion-dollar supplement industry inundated us with FDA-unapproved health claims, but science is continuously advancing and providing us with a multitude of promising health benefits from particular fruits, vegetables, teas, herbs, and spices. For instance, blueberries protect against cardiovascular disease, an apple or pear a day reduces stroke risk by over 52 percent, eating more carrots significantly reduces the risk of bladder cancer, drinking tea reduces cholesterol and helps glucose homeostasis, and cinnamon blocks infection and reduces the risk of some cancers. However, recall that science also tells us that no one nutrient alone is shown to provide these effects.

What micronutrient and phytochemical sources are best at protecting against chronic disease? All of them, together. Just as there is no wonder supplement or drug, there is no superior fruit, vegetable, spice, herb, or tea that protects against all diseases. A review in the July–August 2010 issue of Oxidative Medicine and Cellular Longevity concludes that the plant-food benefits to health are attributed to two main factors—that nutrients and phytochemicals are present at low concentrations in general, and that the complex mixtures of nutrients and phytochemicals provides additive and synergistic effects[4]. In short, don't overdo it with supplements and make sure you incorporate a wide variety of nutrients in your diet.

Eating a variety of fruits and vegetables rich in antioxidants and phytochemicals promotes health. Consider these diets:
Mediterranean diet. Fresh fruit and vegetables are abundant in this diet, and the cultural identity of the diet involves multiple herbs and spices. Moreover, olive oil is the main source of fat. Fish and poultry are consumed in low amounts and red meat is consumed in very low amounts. An analysis of twelve studies involving over one million subjects published in the September 2008 issue of the British Medical Journal reports that people who followed the Mediterranean diet had a 9 percent decrease in overall deaths, a 9 percent decrease in cardiovascular death, a 6 percent decrease in cancer deaths, and a 13 percent reduced incidence of Parkinson's disease and Alzheimer's disease[5]. The authors of this study concluded that the Mediterranean diet is useful as a primary prevention against some major chronic diseases.

Dietary Approaches to Stop Hypertension (DASH diet). Recall from Chapter 7 "Nutrients Important to Fluid and Electrolyte Balance" that the DASH diet is an eating plan that is low in saturated fat, cholesterol, and total fat. Fruits, vegetables, low-fat dairy foods, whole-grain foods, fish, poultry, and nuts are emphasized while red meats, sweets, and sugar-containing beverages are mostly avoided. Results from a follow-up study published in the December 2009 issue of the Journal of Human Hypertension suggest the low-sodium DASH diet reduces oxidative stress, which may have contributed to the improved blood vessel function observed in salt-sensitive people (between 10 to 20 percent of the population)[6].

Diets high in fruits and vegetables. An analysis of The Nurses' Health Study and the Health Professionals' Follow-up Study reported that for every increased serving of fruits or vegetables per day, especially green leafy vegetables and vitamin C-rich fruits, there was a 4 percent lower risk for heart disease[7].

Americans Typically Eat Fewer than the Recommended Servings of High Quality Food-Group Foods

An article in the January 2009 issue of the Medscape Journal of Medicine reports that fewer than one in ten Americans consumes the recommended amount of fruits and vegetables, which is between five and thirteen servings per day[8]. According to this study, the largest single contributor to fruit intake was orange juice, and potatoes were the dominant vegetable.

The USDA recommends that you fill half your plate with fruits and vegetables. The number of servings of fruits and vegetables that a person should consume every day is dependent on age, sex, and level of physical activity. For example, a forty-year-old male who exercises for sixty minutes per day should consume 2 cups of fruit and 3½ cups of vegetables, while a fifteen-year-old female

who exercises for thirty minutes per day should consume 1½ cups of fruit and 2½ cups of vegetables. (One cup of a fruit or vegetable is equal to one banana, one small apple, twelve baby carrots, one orange, or one large sweet potato.) To find out the amount of fruits and vegetables the Centers for Disease Control and Prevention (CDC) recommends, see Note 8.25 “Interactive 8.4”.

Improving Fruit and Vegetable Intake at Home and in Your Community

Eating more fruits and vegetables can make you think better, too. According to a study published in 2009 in the Journal of Alzheimer’s Disease, no matter your age, eating more fruits and vegetables improves your brain function[9]. Check out Note 8.26 “Interactive 8.5” for thirteen fun ways to increase your fruit and vegetable intake.

The CDC has developed seven strategies to increase American’s intake of fruits and vegetables[10].

1. Support local and state governments in the implementation of a Food Policy Council, which develops policies and programs that increase the availability of affordable fruits and vegetables.
2. In the food system, increase the availability and affordability of high-quality fruits and vegetables in underserved populations.
3. Promote farm-to-where-you-are programs, which is the delivery of regionally grown farm produce to community institutions, farmers markets, and individuals.
4. Encourage worksites, medical centers, universities, and other community and business establishments to serve more fruits and vegetables in cafeterias and onsite eateries.
5. Support schools in developing healthy food messages to students by incorporating activities such as gardening into curricula.
6. Encourage the development and support of community and home gardens.
7. Have emergency food programs, including food banks and food rescue programs, increase their supply of fruits and vegetables.

The seven strategies developed by the CDC are based on the idea that improving access to and availability of fruits and vegetables will lead to an increase in their consumption.

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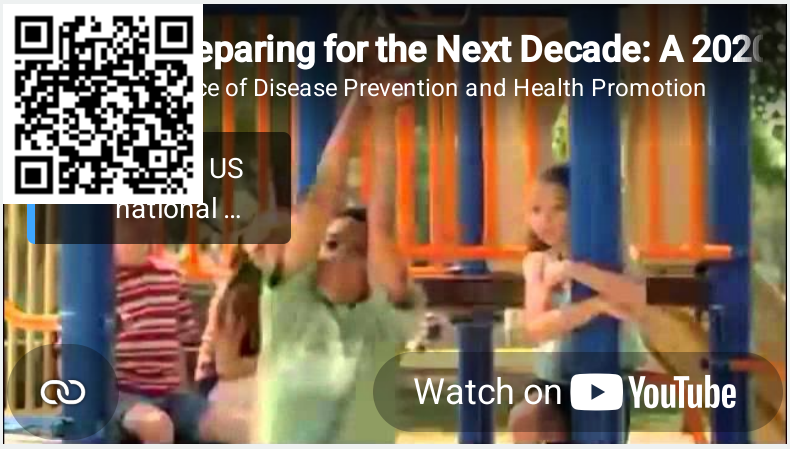
2.6: National Goals for Nutrition and Health- Healthy People 2020

Learning Objectives

- State the Healthy People 2020 nutrition- and weight-status goals.
- List three related objectives for the Healthy People 2020 program.

The Healthy People 2020 program, launched in 2010, is a ten-year national program instituted by the US government with objectives aimed toward improving the health of all Americans. Similar to the *2010 Dietary Guidelines*, it has been established to promote longer lives free of preventable disease, disability, injury, and premature death. With a revived intent on identifying, measuring, tracking, and reducing health disparities through a "determinants of health approach," Healthy People 2020 will strive to create the social and physical environments that promote good health for all and to promote quality of life, healthy development, and healthy behaviors across all life stages. This means that the understanding of what makes and keeps people healthy is consistently refined. The determinants of health approach reflects the evidence from outside factors that greatly affect the health of individuals.US Department of Health and Human Services. "About Healthy People." Last updated March 29, 2012. http://www.healthypeople.gov/2020/about/default.aspx It takes into consideration the circumstances in which people are born, live, work, and age. It also reflects the conditions that shape their circumstances such as money, power, and resources at the local, national, and global levels. Social determinants of health are primarily accountable for the lack of fair health opportunities and the unjust differences in health status that exist within and between countries.World Health Organization. "Social Determinants of Health." © 2012. http://www.who.int/social_determinants/en/.

Video 2.6.1: Preparing for the Next Decade



Preparing for the Next Decade: A 2020 Vision for Healthy People (click to see video)

Helping People Make Healthy Choices

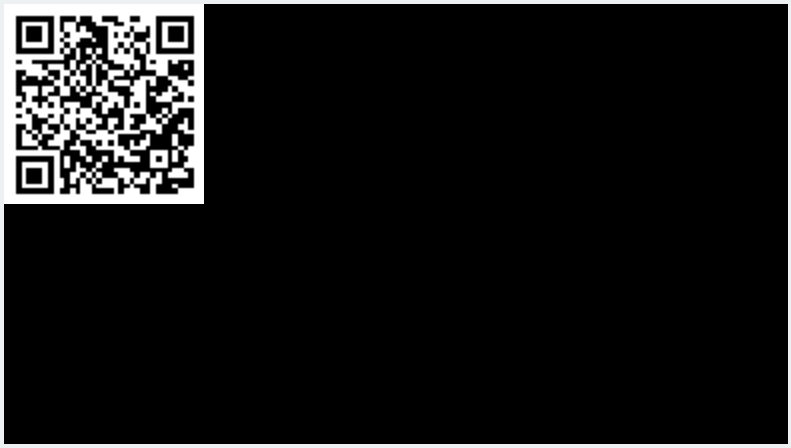
It is not just ourselves, the food industry, and federal government that shape our choices of food and physical activity, but also our sex, genetics, disabilities, income, religion, culture, education, lifestyle, age, and environment. All of these factors must be addressed by organizations and individuals that seek to make changes in dietary habits. The socioeconomic model incorporates all of these factors and is used by health-promoting organizations, such as the USDA and the HHS to determine multiple avenues through which to promote healthy eating patterns, to increase levels of physical activity, and to reduce the risk of chronic disease for all Americans.



Figure 2.6.1: The socioeconomic model helps organizations and the government to plan and promote effective healthy-eating programs tailored to specific populations. © Networkgraphics

Lower economic prosperity influences diet specifically by lowering food quality, decreasing food choices, and decreasing access to enough food. As a result of the recent financial crisis in America the number of people who struggle to have enough to eat is rising and approaching fifty million. In response to these recent numbers, USDA Secretary Tom Vilsack said, "These numbers are a wake-up call…for us to get very serious about food security and hunger, about nutrition and food safety in this country."Amy Goldstein, "Hunger a Growing Problem in America, USDA Reports," *Washington Post*, 17 November 2009. www.washingtonpost.com/wp-dyn...111601598.html.

Video 2.6.2: Determinants of Health



Determinants of Health Approach in Healthy People 2020 (click to see video)

Goals for Nutrition and Weight Status

While Healthy People 2020 has many goals and objectives, we are going to focus on the two goals for nutrition and weight status. They are to promote health and reduce the risk of developing chronic diseases by encouraging Americans to consume healthful diets and to achieve and maintain healthy body weights. Nutrition criteria are reflective of a solid scientific foundation for health and weight management. Emphasis is on modifying individual behavior patterns and habits, and having policies and environments that will support these behaviors in various settings, such as schools and local community-based organizations.



Figure 2.6.2: One of the ways that Healthy People 2020 strives to promote good health and nutrition is by bringing together multiple agencies and groups dedicated to achieving the Healthy People 2020 nationwide objectives. © Shutterstock

Healthy People 2020 has defined their mission as:

- Identify nationwide health improvement priorities
- Increase public awareness and understanding of the determinants of health, disease, and disability, and the opportunities for progress
- Provide measurable objectives and goals that are applicable at the national, state, and local levels
- Engage multiple sectors to take actions to strengthen policies and improve practices that are driven by the best knowledge
- Identify critical research, evaluation, and data-collection needs

Healthy People 2020 has set key recommendations as follows:

- Consume a variety of nutrient-dense foods within and across the food groups, especially whole grains, fruits, vegetables, low-fat or fat-free milk or milk products, and lean meats and other protein sources
- Limit the intake of saturated fat and trans fats, cholesterol, added sugars, sodium (salt), and alcohol
- Limit caloric intake to meet caloric needsUS Department of Health and Human Services. "Nutrition and Weight Status." HealthyPeople.gov. Last updated May 1, 2012. http://healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=29



Figure 2.6.3: Consuming nutrient-dense foods and limiting portion sizes of food will contribute to weight management. Avoiding excessive amounts of anything allows room for many food types in the diet. © Dreamstime

Tools for Change

If you wait many hours between meals, there is a good chance you will overeat. To refrain from overeating try consuming small meals at frequent intervals throughout the day as opposed to two or three large meals. Eat until you are satisfied, not until you feel "stuffed." Eating slowly and savoring your food allows you to both enjoy what you eat and have time to realize that you are full before you get overfull. Your stomach is about the size of your fist but it expands if you eat excessive amounts of food at one sitting. Eating smaller meals will diminish the size of your appetite over time so you will feel satisfied with smaller amounts of food.

Benefits of Following the Healthy People 2020 Goals

Nutrition and weight status are important to children's growth and development. In addition, healthy eating habits will decrease risks for developing chronic health conditions such as obesity, malnutrition, anemia, cardiovascular disease, high blood pressure,

dyslipidemia (poor lipid profiles), Type 2 diabetes, osteoporosis, dental disease, constipation, diverticular disease, and certain types of cancer.

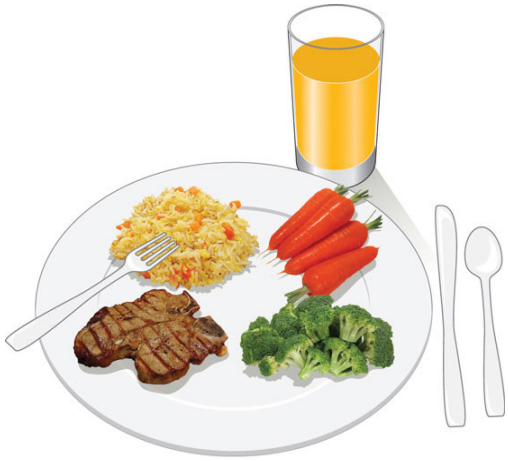


Figure 2.6.4: Following the *2015 Dietary Guidelines* will promote nutrition, weight loss, and weight maintenance as well as the reduction of chronic disease. © Networkgraphics

Meeting the recommended intake for energy needs by adopting a balanced eating regimen as promoted by the USDA's My Food Plate tool will assist people in losing and maintaining weight and in improving overall health.

Objectives Related to the Healthy People 2020 Goals

Seven out of every ten deaths in the United States are caused by chronic diseases, such as heart disease, cancer, and diabetes, and three-quarters of the country's health spending goes toward the cost of treating these diseases. Helping people lose weight, maintain a healthy weight, and prevent chronic disease by improving dietary habits requires providing education about food and nutrition, assuring access to healthier food options, and promoting the desire and ability to become physically active. Some of the Healthy People 2020 program's related objectives are discussed below.

1. **Improve health, fitness, and quality of life through daily physical activity.** The Healthy People 2020 objectives for physical activity are based on the *2008 Physical Activity Guidelines for Americans*, and reflect the strong scientific evidence supporting the benefits of physical activity. More than 80 percent of the current US population, from youth to adults, is not meeting these guidelines. Healthy People 2020 highlights the way that one's level of physical activity is affected by environmental factors such as the availability of safe sidewalks, bike lanes, trails, and parks. It also highlights the legislative policies that improve access to facilities that promote physical activity. Understanding that personal, social, economic, and environmental barriers to physical activity all have a part in determining a population's physical activity level, is an important part of being able to provide interventions that foster physical activity. Consistent physical activity is necessary for preventing chronic disease, improving bone health, decreasing body fat, and preventing an early death.

Video 2.6.3: Active versus Sedentary Lifestyles



This video provides a short overview of leading an active life versus a sedentary life.

2. **Increase the quality, availability, and effectiveness of educational and community-based programs designed to prevent disease and injury, improve health, and enhance quality of life.** Healthy eating is a learned behavior. By increasing the number of community-based programs (schools, workplace, health-care facilities, local community groups) that offer guidance for healthy eating and lifestyle choices, people of all ages will learn good eating habits and will gain access to good food choices to help improve their diet and overall health.
3. **Improve the development, health, safety, and well-being of adolescents and young adults.** Adolescents (ten to nineteen years of age) and young adults (twenty to twenty-four years of age) constitute 21 percent of the population of the United States. The financial burdens of preventable health problems and associated long-term costs of chronic diseases in this demographic group have the potential to be vast, and will be the result of attitudes and behaviors initiated during adolescence. For example, the annual adult health-related financial burden of cigarette smoking, which usually starts by age eighteen, is $193 billion.Adhikari, B. et al. "Smoking-Attributable Mortality, Years of Potential Life Lost, and Productivity Losses—United States, 2000–2004." *MMWR CDC Surveill Summ* 57, no. 45 (November 14, 2008): 1226–8. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5745a3.htm.



Figure 2.6.5: Healthy children will lead to a healthy adult population with less disease, lower healthcare costs, and increased longevity. © Shutterstock

4. **Reduce the consumption of calories from SoFAS in the population aged two years and older.** A diet high in SoFAS contributes to excessive weight gain and poor health. Added sugars provide no nutritional value to foods. Excessive fat and sugar intake promotes tooth decay, obesity, Type 2 diabetes, unhealthy cholesterol levels, and heart disease. Being overweight increases susceptibility for developing high blood pressure, diabetes, cardiovascular diseases, and certain types of cancer. The evidence is clear that many chronic diseases are linked to unhealthy dietary patterns. Excessive consumption of SoFAS, in combination with the lack of plant-based foods, may contribute to higher rates of developing chronic diseases.

For more information on Healthy People 2020 and its related objectives for nutrition and weight status, please visit the website http://www.healthypeople.gov/2020.

Key Takeaways

- Healthy People 2020 is a health initiative with a ten-year objective of helping Americans improve health and well-being, and to live long, healthy lives. Among its many objectives are to promote health and reduce the risk of developing chronic diseases by encouraging Americans to consume healthful diets and to achieve and maintain healthy body weights.
- The goals of Healthy People 2020 are founded upon a determinants of health approach, which means they are reflective of the circumstances in which people are born, live, and work, as well as the conditions that shape their circumstances such as money, power, and resources at the local, national, and global levels. Diet patterns are influenced by genetics, environment, and cultural values. All of these things must be considered to provide the optimal approach to improving the health of the American population.
- Decreasing caloric intake and increasing physical activity are important strategies in achieving the goals of the Healthy People 2020 program.

Discussion Starters

1. Think of fun ways to increase physical activity in your life. Think small but frequent and think about things you can incorporate easily in your regular daily activities.
2. Review some of the Healthy People 2020 nutrition and physical activity program objectives. What objectives would you like to see enacted in your community? Why is this important to you? http://www.healthypeople.gov/2020

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CHAPTER OVERVIEW

3: Food Politics and Perspectives

In this chapter, food politics, sustainability, the food industry, food security, and diets from around the world are explored.

3.1: Prelude to Food Politics and Perspectives
3.2: Historical Perspectives on Food
3.3: The Food Industry
3.4: The Politics of Food
3.5: Food Cost and Inflation
3.6: The Issue of Food Security
3.7: Nutrition and Your Health
3.8: Diets around the World
3.E: Food Politics and Perspectives (Exercise)

Template:HideTOC

Thumbnail: Members of the Pure Milk Association dump milk before it could get to a non-member dairy in Harvard, Illinois sometime in the 1930s. The successful “Milk Strike” led to organizing farmers to get higher prices for their milk. Image is considered public domain.

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3.1: Prelude to Food Politics and Perspectives

Big Ideas

- Sustainability promotes nutrition today and protects natural resources for tomorrow.

As discussed in previous chapters, sustainability is a word that's often talked about in the realm of food and nutrition. The term relates to the goal of achieving a world that meets the needs of its present inhabitants while preserving resources for future generations. As awareness about sustainability has increased among the media and the public, both agricultural producers and consumers have made more of an effort to consider how the choices they make today will impact the planet tomorrow.



Figure 3.1.1: Raising free-range chickens that feed out in the open is one example of a sustainable agricultural practice. Free Range Hens The eggs these hens produce will be pretty tasty. from Adam Ward (via Wikipedia).

However, defining sustainability can be difficult because the term means different things to different groups. For most, sustainable agriculture can best be described as an umbrella term that encompasses food production and consumption practices that do not harm the environment, that do support agricultural communities, and that are healthy for the consumer.Sustainable Table. "Introduction to Sustainability." Accessed October 10, 2011. www.sustainabletable.org/intro/. From factory farms to smaller-scale ranches and granges, sustainable farming practices are being implemented more and more as the long-term viability of the current production system has been called into question.

Yet, the concept of sustainability is not new to agricultural science, practice, or even policy. It has evolved throughout modern history as a way to achieve self-reliance. It is also a vehicle for maintaining rural communities and supporting the concept of conservation and protection of the land.Ecological Agriculture Projects. "A History of Sustainable Agriculture." © 1990 Rod MacRae. http://eap.mcgill.ca/AASA_1.htm. In 1990, the US federal government defined sustainable agriculture in a piece of legislation known as the Farm Bill. The practice was described as an integrated system of plant and animal production that satisfies human needs for food, along with fiber for fabric and other uses. The Farm Bill further defines sustainable agriculture as a practice that enhances environmental quality and also the natural resource base upon which the agricultural economy depends. Sustainable agriculture also makes the most efficient use of nonrenewable resources, sustains the economic viability of farm operations, and supports the quality of life for farmers and society as a whole.Gold, M.V. "Sustainable Agriculture: Definitions and Terms." US Department of Agriculture, National Agricultural Library. *Special Reference Briefs Series* no. SRB 99-02 (September 1999, August 2007). http://www.nal.usda.gov/afsic/pubs/t...902.shtml#toc1.

In other words, the practice of sustainable agriculture strives to eschew conventional farming methods, including the cultivation of single crops and row crops continuously over many seasons, the dependency on agribusiness, and the rearing of livestock in concentrated, confined systems.Gold, M.V. "Sustainable Agriculture: Definitions and Terms." US Department of Agriculture, National Agricultural Library. *Special Reference Briefs Series* no. SRB 99-02 (September 1999, August 2007). http://www.nal.usda.gov/afsic/pubs/t...902.shtml#toc1. Instead, sustainability includes a focus on biodiversity among both crops and livestock; conservation and preservation to replenish the soil, air, and water; animal welfare; and fair treatment and wages for farm workers.Sustainable Table. "What Is Sustainable Agriculture?" Accessed October 10, 2011. www.sustainabletable.org/intro/whatis/. Sustainable agriculture also encourages the health of consumers by rejecting extensive use

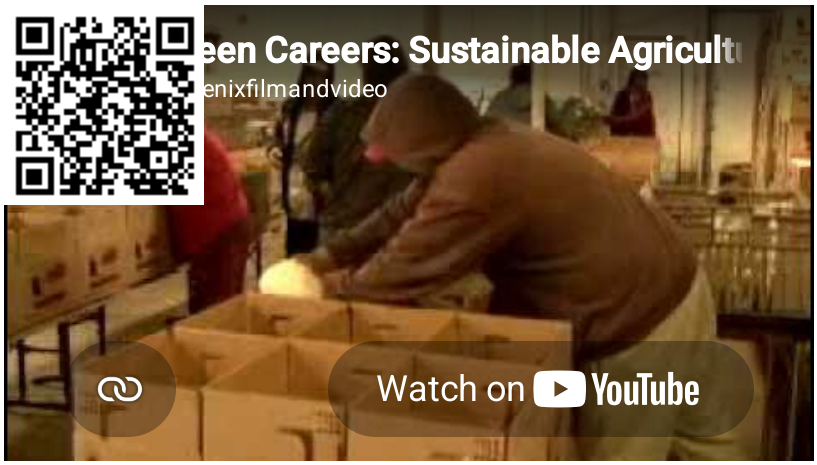
of pesticides and fertilizers and promoting the consumption of organic, locally produced food. Although many farmers and food companies work to implement these practices, some use the idea of sustainability to attract consumers without completely committing to the concept. “Greenwashing” is a derisive term (similar to “whitewashing”) for a corporation or industry falsely utilizing a proenvironmental image or message to expand its market base.

Sustainability depends not only on agricultural producers, but also on consumers. The average person can do a number of things to consume a more sustainable diet, from eating less meat to purchasing fruits and vegetables grown on nearby farms. For example, produce sold in the Midwest typically travels an average of more than fifteen hundred miles from farm to supermarket. However, increasing the consumption of more locally-grown produce by 10 percent would save thousands of gallons in fossil fuel each year.Heller, M. C., G. A. Keoleian. “US Food System Factsheet.” Center for Sustainable Systems, University of Michigan. *CSS Factsheets*, no. CSS01-06 (2001). http://www.css.snre.umich.edu/public...us-food-system.

You Decide

How will you adapt your lifestyle and dietary choices to help promote sustainable agricultural practices?

Some consumers are choosing to make smarter nutritional choices, eat healthier foods, and enjoy fresh, locally grown products. They read the labels on products in their local stores, make more home-cooked meals using whole-food ingredients, and pay attention to the decisions that legislators and other officials make regarding food production and consumption. Will you be one of them? How you can adjust your dietary selections to benefit not only your body and mind but also to help sustain the planet for future generations?



Video 3.1.1: Green Careers: Sustainable Agriculture. This video focuses on the role of a farm manager on a small farm that follows sustainable agricultural practices.

3.1: Prelude to Food Politics and Perspectives is shared under a CC BY-NC-SA license and was authored, remixed, and/or curated by LibreTexts.

3.2: Historical Perspectives on Food

Learning Objectives

- Contrast ancient perspectives on food and nutrition with more modern explanatory systems

Throughout history, our relationship with food has been influenced by changing practices and perspectives. From the invention of agriculture to the birth of refrigeration, technological advances have also affected what we eat and how we feel about our food. Therefore, it can be helpful to examine theories and customs related to diet and nutrition across different civilizations and time periods.

Civilizations and Time Periods

Diet and cuisine have undergone enormous changes from ancient times to today. The basic diet of the ancient era consisted of cereals, legumes, oil, and wine. These staples were supplemented by vegetables and meat or fish, along with other items, such as honey and salt. During the Middle Ages, poor people consumed meager diets that consisted of small game supplemented with either barley, oat, or rye, while the wealthy had regular access to meat and fish, along with wheat.Our Food Recipes. “European Medieval Food.” © 2011–2012. www.our-food-recipes.com/medieval-food.html. During the Industrial Revolution, diets became more varied, partly because of the development of refrigeration and other forms of food preservation. In the contemporary era, many people have access to a wide variety of food that is grown locally or shipped from far-off places.



Figure 3.2.1: Flatbread made from barley or wheat was a staple in the traditional diet during the ancient era. Image used with permissin (CC -BY-SA 3.0; Jonathunder).

Hunters and Gatherers

Human beings lived as hunters and gatherers until the invention of agriculture. Following a nomadic lifestyle, early people hunted, fished, and gathered fruit and wild berries, depending on their location and the availability of wild plants and wild game. To aid their constant quest for food, humans developed weapons and tools, including spears, nets, traps, fishing tackle, and the bow and arrow.Our Food Recipes. “Pre Historic Food.” © 2011–2012. www.our-food-recipes.com/pre-...oric-food.html.

The Beginning of Agriculture

About ten thousand years ago, people began to cultivate crops and domesticate livestock in Mesopotamia, an area of the world that is known today as the Middle East. Agriculture flourished in this region due to the fertile floodplain between the Euphrates and Tigris Rivers, and early crops included wheat, barley, and dates. The development of agriculture not only enriched the diet of these early people, it also led to the birth of civilization as farmers began to settle into sizable, stable communities.Bioworld. “History of Agriculture.” Accessed October 10, 2011. www.bioworldusa.com/agricultu...ry-agriculture.

One of the most fertile regions of the ancient world was located along the Nile River Valley in ancient Egypt. The rich soil yielded several harvests per year. Common crops were barley, wheat, lentils, peas, and cabbage, along with grapes, which were used to make wine. Even poor Egyptians ate a reasonably healthy diet that included fish, vegetables, and fruit. However, meat was

primarily a privilege of the rich. Popular seasonings of this era included salt, pepper, cumin, coriander, sesame, fennel, and dill.Experience Ancient Egypt. “Ancient Egyptian Food: The Pharaonic Diet.” © 2009–2011. http://www.experience-ancient-egypt....tian-food.html.

The “Three Sisters”

Thousands of years ago, across an area that encompasses Mexico and Central America today,Foundation for the Advancement of Mesoamerican Studies. “Mesoamerica.” Accessed October 10, 2011. http://www.famsi.org/. Mesoamerican farmers cultivated three major plants—squash, beans, and maize (also known as corn). Known as the “three sisters,” these crops proved to be both complementary and sustainable. Corn provides a pole for bean vines to climb. The roots of bean vines provide nitrogen that helps corn grow. These vines also stabilize corn stalks by making them less vulnerable to the wind. Shallow-rooted squash vines prevent the evaporation of soil moisture, while their spiny plants discourage predators. Both of these attributes aid the cultivation of all three crops.Renee’s Garden. “Celebrate the Three Sisters,” During the post-Columbian era, Native American groups adopted the practice of interplanting squash, beans, and maize, and now thousands of years later, many small farmers continue to cultivate the “three sisters.”

Meals Determined Social Status

In ancient Rome, differences in social standing affected the diet. For people of all socioeconomic classes, breakfast and lunch were typically light meals that were often consumed in taverns and cafes. However, dinners were eaten at home and were taken much more seriously. Wealthy senators and landowners ate meals with multiple courses, including appetizers, entrees, and desserts. Rich Romans also held extravagant dinner parties, where guests dined on exotic foods, such as roasted ostrich or pheasant. In contrast, people of the lower classes ate mostly bread and cereals.PBS. “Home Life.” *The Roman Empire in the First Century*. © 2006 Devillier Donegan Enterprises. http://www.pbs.org/empires/romans/empire/home.html. The average person ate out of clay dishes, while wealthy people used bronze, gold, or silver.

Social status determined the kinds of food that people consumed in many other parts of the world as well. In ancient China, emperors used their wealth and power to hire the best chefs and acquire delicacies, such as honey, to sweeten food. Dishes of the ancient era included steamed Mandarin fish, rice and wheat noodles, and fried prawns. Imperial cuisine also included improved versions of dishes that were consumed by the common people, such as soups and cereals.China.org. “The History of Chinese Imperial Cuisines.” © China Information Center. Accessed December 5, 2011. http://www.china.org.cn/english/imperial/25995.htm.

The Medieval Era

The eating habits of most people during the Medieval Era depended mainly on location and financial status. In the feudal system of Europe, the majority of the population could not afford to flavor their food with extravagant spices or sugar. In addition, transporting food was either outrageously expensive or out of the question due to the inability to preserve food for a long period of time. As a result, the common diet consisted of either wheat, meat, or fish, depending on location. The typical diet of the lower classes was based on cereals and grains, porridge, and gruel. These staples were supplemented with seasonal fruits, vegetables, and herbs. Wine, beer, and cider were also common, and were often safer to drink than the unsanitized, untreated water.

The Crusades

During the Medieval Era, soldiers from Europe waged war over religion in the Middle East in military campaigns that came to be known as the Crusades. Upon their return, the crusaders brought back new foods and spices, exposing Europeans of the Middle Ages to unusual flavors. Cooking with exotic spices, such as black pepper, saffron, and ginger, became associated with wealth because they were expensive and had to be imported.

Food Preservation in the Past

During the Medieval and Renaissance eras, most meals consisted of locally grown crops because it was extremely difficult to transport food over long distances. This was mostly due to an inability to preserve food for long periods. At that time, food preservation consisted mostly of drying, salting, and smoking. Pickling, which is also known as brining or corning, was another common practice and involved the use of fermentation to preserve food.

The Modern Era

The modern era began in North America and Europe with the dawn of the Industrial Age. Before that period, people predominantly lived in agrarian communities. Farming played an important role in the development of the United States and Canada. Almost all areas of the country had agrarian economies dictated by the harvesting seasons.

In the 1800s, society began to change as new machines made it easier to cultivate crops, and to package, ship, and store food. The invention of the seed drill, the steel plow, and the reaper helped to speed up planting and harvesting. Also, food could be transported more economically as a result of developments in rail and refrigeration. These and other changes ushered in the modern era and affected the production and consumption of food.

Food Preservation in Modern Times

Technological innovations during the 1800s and 1900s also changed the way we cultivate, prepare, and think about food. The invention and refinement of the refrigerator and freezer made it possible for people to store food for much longer periods. This, in turn, allowed for the transportation of food over greater distances. For example, oranges grown in Florida would still be fresh when they arrived in Seattle.

Prior to refrigeration, people relied on a number of different methods to store and preserve food, such as pickling. Other preservation techniques included using sugar or honey, canning, and preparing a confit, which is one of the oldest ways to preserve food and involves salting meat and cooking it in its own fat. To store foods for long periods, people used iceboxes or kept vegetables, such as potatoes, onions, and winter squash, in cellars during the winter months.

The Great Depression

During the Great Depression of the 1930s, the United States faced incredible food shortages and many people went hungry. This was partly because extreme droughts turned parts of the Midwest into a Dust Bowl, where farmers struggled to raise crops. Millions of Americans were unemployed or underemployed and were forced to wait in long breadlines for free food. This was also a period of incredible reforms, as the government worked to provide for and protect the people. Some important changes included subsidies and support for suffering farmers.

World War II

Food shortages also occurred during World War II in the 1940s. At that time, people voluntarily made due with less to ensure that soldiers training and fighting overseas had the supplies they needed. To focus on saving at home, government programs included rationing food (particularly meat, butter, and sugar), while the media encouraged families to plant their own fruits and vegetables in “victory” (backyard) gardens.

Contemporary Life

Today, agriculture remains a large part of the economy in many developing nations. In fact, nearly 50 percent of the world’s labor is employed in agriculture.Bioworld. “History of Agriculture.” Accessed October 10, 2011. www.bioworldusa.com/agricultu...ry-agriculture. In the United States however, less than 2 percent of Americans produce food for the rest of the population.Gold, M.V. “Sustainable Agriculture: Definitions and Terms.” US Department of Agriculture, National Agricultural Library. *Special Reference Briefs Series* no. SRB 99-02 (September 1999, August 2007). http://www.nal.usda.gov/afsic/pubs/t...902.shtml#toc1. Also, most farms are no longer small-scale or family-owned. Large-scale agribusiness is typical for both crop cultivation and livestock rearing, including concentrated animal feeding operations. Conventional farming practices can include abuses to animals and the land. Therefore, more and more consumers have begun to seek out organic and locally grown foods from smaller-scale farms that are less harmful to the environment.

Other changes also affect food production and consumption in the modern era. The invention of the microwave in the 1950s spurred the growth of frozen foods and TV dinners. Appliances such as blenders and food processors, toasters, coffee and espresso machines, deep fryers, and indoor grills have all contributed to the convenience of food preparation and the kinds of meals that people enjoy cooking and eating.

Diet Trends Over Time

Today, consumers can choose from a huge variety of dietary choices that were not available in the past. For example, strawberries can be purchased in New York City in wintertime, because they are quickly and easily transported from places where the crop is in

season, such as California, Mexico, or South America. In the western world, especially in North America, food products are also relatively cheap. As a result, there is much less disparity between the diets of the lower and upper classes than in the past. It would not be unusual to find the same kind of meat or poultry served for dinner in a wealthy neighborhood as in a poorer community.

Key Takeaways

Perspectives and practices related to food and nutrition have greatly changed from the ancient era to today. In the ancient world, location and economic status had a profound effect on what people ate. Also, societies often were based on crop cultivation and livestock rearing, which influenced how people ate, worked, and lived. During the Medieval Era, people became more exposed to food from other parts of the world because of the growing ability to ship goods and because of the Crusades, among other factors. Technological advances, such as refrigeration and the microwave, have had huge effects on the way food is produced and consumed.

Discussion Starter

1. Compare and contrast the diet of a civilization from the ancient world or the Medieval Era to the food choices of today. In what ways has our diet changed? In what ways has it remained the same?

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3.3: The Food Industry

Learning Objectives

- Explain what is meant by the term “the food industry” and identify the food technologies and innovations that have shaped the current food system

Agriculture is one of the world’s largest industries. It encompasses trillions of dollars and employs billions of people. In the United States alone, customers spent about $500 billion annually on food products at grocery stores and supermarkets.Plunkett Research, Ltd. “US Food Industry Overview.” Accessed December 5, 2011, http://www.plunkettresearch.com/food...ocery%20market%20research/industry%20statistics. The food industry includes a complex collective of businesses that touches on everything from crop cultivation to manufacturing and processing, from marketing and advertising to distribution and shipment, to food regulation.

The Food System

The food system is a network of farmers and related operations, including food processing, wholesale and distribution, retail, industry technology, and marketing. The milk industry, for example, includes everything from the farm that raises livestock, to the milking facility that extracts the product, to the processing company that pasteurizes milk and packages it into cartons, to the shipping company that delivers the product to stores, to the markets and groceries that stock and sell the product, to the advertising agency that touts the product to consumers. All of these components play a part in a very large system.

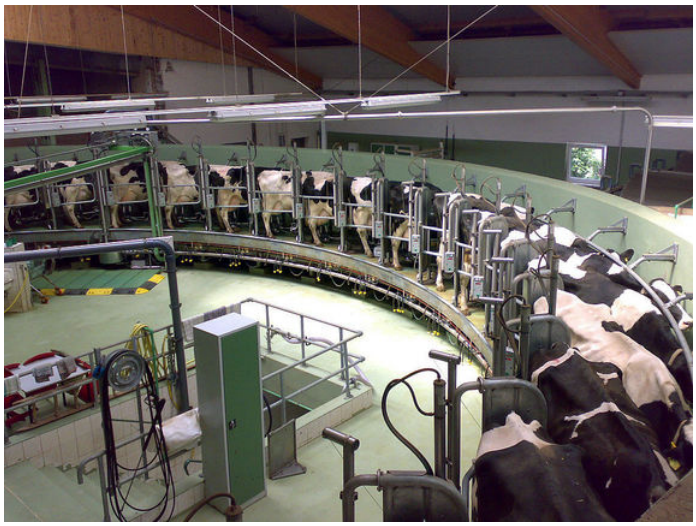


Figure 3.3.1: These cows are lined up at a Rotary milking parlor. (CC BY-SA 3.0; Gunnar Richter Namenlos.net).

Food Preservation and Processing

Two important aspects of a food system are preservation and processing. Each provides for or protects consumers in different ways. Food preservation includes the handling or treating of food to prevent or slow down spoilage. Food processing involves transforming raw ingredients into packaged food, from fresh-baked goods to frozen dinners. Although there are numerous benefits to both, preservation and processing also pose some concerns, in terms of both nutrition and sustainability.

Food Preservation

Food preservation protects consumers from harmful or toxic food. There are different ways to preserve food. Some are ancient methods that have been practiced for generations, such as curing, smoking, pickling, salting, fermenting, canning, and preserving fruit in the form of jam. Others include the use of modern techinques and technology, including drying, vacuum packing, pasteurization, and freezing and refrigeration. Preservation guards against food-bourne illnesses, and also protects the flavor, color, moisture content, or nutritive value of food.

Irradiation

Another method of preservation is irradiation, which reduces potential pathogens to enhance food safety. This process involves treating food with ionizing radiation, which kills the bacteria and parasites that cause toxicity and disease. Similar technology is used to sterilize surgical instruments to avoid infection.Centers for Disease Control and Prevention. “Food Irradiation.” Accessed October 11, 2005. www.cdc.gov/ncidod/dbmd/disea...rradiation.htm. Foods currently approved for irradiation by the FDA include flour, fruits and vegetables, juices, herbs, spices, eggs, and meat and poultry.

Most forms of preservation can affect the quality of food. For example, freezing slightly affects the nutritional content, curing and smoking can introduce carcinogens, and salting greatly increases the sodium. There are also concerns about the effects of using irradiation to preserve food. Studies have shown that this process can change the flavor, texture, color, odor, and nutritional content of food. For example, the yolks of irradiated eggs have less color than nonirradiated eggs.

Food Processing

Food processing includes the methods and techniques used to transform raw ingredients into packaged food. Workers in this industry use harvested crops or slaughtered and butchered livestock to create products that are marketed to the public. There are different ways in which food can be processed, from a one-off product, such as a wedding cake, to a mass-produced product, such as a line of cupcakes packaged and sold in stores.

The Pros and Cons of Food Processing

Food processing has a number of important benefits, such as creating products that have a much longer shelf life than raw foods. Also, food processing protects the health of the consumer and allows for easier shipment and the marketing of foods by corporations. However, there are certain drawbacks. Food processing can reduce the nutritional content of raw ingredients. For example, canning involves the use of heat, which destroys the vitamin C in canned fruit. Also, certain food additives that are included during processing, such as high fructose corn syrup, can affect the health of a consumer. However, the level of added sugar can make a major difference. Small amounts of added sugar and other sweeteners, about 6 to 9 teaspoons a day or less, are not considered harmful.American Heart Association. “Sugar and Carbohydrates.” Last updated October 12, 2010. www.heart.org/HEARTORG/Gettin...6_Article.jsp#.



Figure 3.3.2: Industrial cheese production. 10,000 l milk in the left tank, the milk was mixed with rennet and is now broken for the production of Emmentaler.. (CC BY-SA 3.0; MatthiasKabel).

Food Regulation and Control

Food regulatory agencies work to protect the consumer and ensure the safety of our food. Food and drug regulation in the United States began in the late nineteenth century when state and local governments began to enact regulatory policies. In 1906, Congress passed the Pure Food and Drugs Act, which led to the creation of the US Food and Drug Administration (FDA). Today, a number of agencies are in charge of monitoring how food is produced, processed, and packaged.EH.Net Encyclopedia. “History of Food and Drug Regulation in the United States.” February 4, 2010. eh.net/encyclopedia/article/L...rug.Regulation.

Regulatory Agencies

Food regulation is divided among different agencies, primarily the FDA and the US Department of Agriculture (USDA). Regulatory agencies in Canada include the Canadian Food Inspection Agency and Health Canada. The North American public depends on these and other agencies to ensure that the food they purchase and consume from supermarkets, restaurants, and other

sources is safe and healthy to eat. It can be confusing to know which agency monitors and manages which regulatory practice. For example, the FDA oversees the safety of eggs when they're in the shells, while the USDA is in charge of the eggs once they are out of their shells.

The Food and Drug Administration

The FDA enforces the safety of domestic and imported foods. It also monitors supplements, food labels, claims that corporations make about the benefits of products, and pharmaceutical drugs. Sometimes, the FDA must recall contaminated foods and remove them from the market to protect public health. For example, in 2011 contaminated peanut butter led to the recall of thousands of jars of a few popular brands.US Food and Drug Administration. "FDA 101: Product Recalls—From First Alert to Effectiveness Checks." Last updated September 9, 2011. http://www.fda.gov/ForConsumers/Cons.../ucm049070.htm. Recalls are almost always voluntary and often are requested by companies after a problem has been discovered. In rare cases, the FDA will request a recall. But no matter what triggers the removal of a product, the FDA's role is to oversee the strategy and assess the adequacy and effectiveness of the recall.



Video 3.3.1: FDA 101: Product Recalls. This video explains how the FDA recalls contaminated products to protect consumers.

The US Department of Agriculture

Headed by the Secretary of Agriculture, the USDA develops and executes federal policy on farming and food. This agency supports farmers and ranchers, protects natural resources, promotes trade, and seeks to end hunger in the United States and abroad. The USDA also assures food safety, and in particular oversees the regulation of meat, poultry, and processed egg products.

The Environmental Protection Agency

A third federal government agency, the Environmental Protection Agency (EPA), also plays a role in the regulation of food. The EPA works to protect human health and the environment. Founded in 1970, the agency conducts environmental assessment, education, research, and regulation. The EPA also works to prevent pollution and protect natural resources. Two of its many regulatory practices in the area of agriculture include overseeing water quality and the use of pesticides.

Food Safety and Hazard Analysis

Government regulatory agencies utilize HACCP programs to ensure food safety. HACCP, or hazard analysis and critical control points, is a system used to identify potential hazards and prevent foodbourne illnesses. Some of the seven aspects of an HACCP program include identifying the points in a manufacturing process during which potential hazards could be introduced, establishing corrective actions, and maintaining record-keeping procedures. The USDA uses HACCP to regulate meat, while the FDA uses the seven-point system to monitor seafood and juice. In these industries, HACCP systems are used in all stages of production, processing, packaging, and distribution.US Food and Drug Administration. "Hazard Analysis & Critical Control Points (HACCP)." Last updated April 27, 2011. www.fda.gov/food/foodsafety/h...cp/default.htm. Currently, the use of HACCP is voluntary for all other food products.

Food Additives

If you examine the label for a processed food product, it is not unusual to see a long list of added materials. These natural or synthetic substances are food additives and there are more than three hundred used during food processing today. The most popular additives are benzoates, nitrites, sulfites, and sorbates, which prevent molds and yeast from growing on food.How Stuff Works. "The Dangers of Food Additives." Accessed October 5, 2011. http://health.howstuffworks.com/wellness/food-nutrition/facts/dangers-of-food -additives.htm.

Food additives are introduced in the processing stage for a variety of reasons. Some control acidity and alkalinity, while others enhance the color or flavor of food. Some additives stabilize food and keep it from breaking down, while others add body or texture. Table 3.3.1 lists some common food additives and their uses:

Table 3.3.1: Food Additives

Additive	Reason for Adding
Beta-carotene	Adds artificial coloring to food
Caffeine	Acts as a stimulant
Citric acid	Increases tartness to prevent food from becoming rancid
Dextrin	Thickens gravies, sauces, and baking mixes
Gelatin	Stabilizes, thickens, or texturizes food
Modified food starch	Keeps ingredients from separating and prevents lumps
MSG	Enhances flavor in a variety of foods
Pectin	Gives candies and jams a gel-like texture
Polysorbates	Blends oil and water and keep them from separating
Soy lecithin	Emulsifies and stabilizes chocolate, margarine, and other items
Sulfites	Prevent discoloration in dried fruits
Xanthan gum	Thickens, emulsifies, and stabilizes dairy products and dressings

Source: Center for Science in the Public Interest. "Chemical Cuisine: Learn about Food Additives." ©2012. Center for Science in the Public Interest. http://www.cspinet.org/reports/chemcuisine.htm.

The Pros and Cons of Food Additives

The FDA works to protect the public from potentially dangerous additives. Passed in 1958, the Food Additives Amendment states that a manufacturer is responsible for demonstrating the safety of an additive before it can be approved. The Delaney Clause that was added to this legislation prohibits the approval of any additive found to cause cancer in animals or humans. However, most additives are considered to be "generally recognized as safe," a status that is determined by the FDA and referred to as GRAS.

Food additives are typically included in the processing stage to improve the quality and consistency of a product. Many additives also make items more "shelf stable," meaning they will last a lot longer on store shelves and can generate more profit for store owners. Additives can also help to prevent spoilage that results from changes in temperature, damage during distribution, and other adverse conditions. In addition, food additives can protect consumers from exposure to rancid products and food-bourne illnesses.

Food additives aren't always beneficial, however. Some substances have been associated with certain diseases if consumed in large amounts. For example, the FDA estimates that sulfites can cause allergic reactions in 1 percent of the general population and in 5 percent of asthmatics. Similarly, the additive monosodium glutamate, which is commonly known as MSG, may cause headaches, nausea, weakness, difficulty breathing, rapid heartbeat, and chest pain in some individuals.Sustainable Table. "The Issues: Additives." Accessed October 10, 2011. www.sustainabletable.org/issu...dditives/#fn14.

The Effect of New Technologies

As mentioned earlier, new technology has had a tremendous effect on the food we eat and the customs and culture related to food consumption. For example, microwaves are used to reduce cooking time or to heat up leftover food. Refrigerators and freezers allow produce to travel great distances and last longer. On the extreme end of making food last longer, there is special food for astronauts that is appropriate for consumption in space. It is safe to store, easy to prepare in the low-gravity environment of a spacecraft, and contains balanced nutrition to promote the health of people working in space. In the military, soldiers consume Meals Ready-to-Eat (MREs), which contain an entire meal in a single pouch.

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.Genomics.Energy.gov. "What Are Genetically Modified Foods?" Last modified November 5, 2008. http://www.ornl.gov/sci/techresource...i/gmfood.shtml. 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.Whitman, D. B. "Genetically Modified Foods: Harmful or Helpful?" *ProQuest Discovery Guides* (April 2000). www.csa.com/discoveryguides/g...d/overview.php.

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 nongenetically engineered organisms.World Health Organization. "Food Safety: 20 Questions on Genetically Modified Foods." © 2011. http://www.who.int/foodsafety/public...0questions/en/.

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.Whitman, D. B. "Genetically Modified Foods: Harmful or Helpful?" *ProQuest Discovery Guides* (April 2000).



Video 3.3.2: Too Much Controversy Over Genetically Modified Foods?

Food Enrichment and Fortification

Many foods are enriched or fortified to boost their nutritional value. Enrichment involves adding nutrients to restore those that were lost during processing. For example, iron and certain B vitamins are added to white flour to replace the nutrients that are removed in the process of milling wheat. Fortification is slightly different than enrichment and involves adding new nutrients to enhance a food's nutritive value. For example, folic acid is typically added to cereals and grain products, while calcium is added to some orange juice.

The Health of the Population

Certain enrichment and fortification processes have been instrumental in protecting public health. For example, adding iodine to salt has virtually eliminated iodine deficiencies, which protects against thyroid problems. Adding folic acid to wheat helps increase intake for pregnant women, which decreases the risk of neural tube defects in their children. Also, vegans or other people who do not consume many dairy products are able to drink orange juice or soy milk that has been fortified with calcium to meet the daily recommendations. However, there is some concern that foods of little nutritive value will be fortified in an effort to improve their allure, such as soft drinks with added vitamins.

Key Takeaways

The food industry encompasses all aspects of food production: manufacturing, distribution, marketing, retail, regulation, and consumption. Food preservation and processing have a number of benefits including improving the quality of food products, making them more shelf-stable, and aiding the marketing and advertising of food. There are more than three hundred additives used during food processing today. Food preservation and processing also have some drawbacks, including potentially damaging the nutritive value of food. The cultivation and consumption of genetically modified foods are also highly controversial, with many people opposed to the genetic modification of crops. There are three key government agencies that regulate food in the United States: the US Department of Agriculture, the US Food and Drug Administration, and the US Environmental Protection Agency.

Discussion Starter

1. Discuss the debate about the use of food additives, such as beta-carotene and citric acid. What are the benefits to using them? What are the drawbacks? Do you believe that food additives are more helpful or more harmful, and why?

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3.4: The Politics of Food

Learning Objectives

- Discuss how food has become politicized, and give specific examples of how food choices are related to food politics

Some people have begun to view their choices regarding diet and nutrition in light of their political views. More and more, consumers weigh their thoughts on the environment and the world, while making decisions about what to purchase in the grocery store. For example, many people choose to eat free-range chickens due to concerns about animal welfare. Others worry about the higher cost of organically produced food or find that those products are not available in their communities. As a result, feelings about food have become a political mine field.

Food Politics

The production and sale of food is an extremely big business and touches people in all industries and walks of life. Food is not only crucial for day-to-day survival, but also strongly affects overall health and well-being, as well as the economy and culture of a region or a country. So, it is no wonder that more and more producers and consumers alike are speaking out about food to ensure that their interests are protected. Food politics can influence many stakeholders and interests, but always involve the production, regulation, inspection, distribution, and/or retail of food.

Stakeholders

Stakeholders in food politics include large and small farmers, along with large and small food companies. Other important stakeholders include restaurants and other food-service providers, food distributors, grocery stores and other retail outlets, consumers, and trade associations. Antihunger advocates, nutrition advocates, and food-industry lobbyists also have important roles to play. Nongovernmental organizations, such as the American Cancer Society and the WHO, also work to promote good health and nutrition. Each group has its own perspective and its own agenda in disputes related to food.

Disputes

Food politics can be influenced by ethical, cultural, medical, and environmental disputes over agricultural methods and regulatory policies. They are also greatly influenced by manufacturing processes, marketing practices, and the pursuit of the highest possible profit margin by food manufacturers and distributers. Common disputes and controversies include the genetic modification of plants, the potential dangers of food additives, chemical run-off from large-scale farms, and the reliance on factory-farming practices, such as the use of pesticides in crop cultivation and antibiotics in livestock feed. Additional issues and concerns include the use of sugar, salt, and other potentially unhealthy ingredients, the promotion of fast food and junk food to children, and sanitary standards related to livestock.

The Nitrate Dispute

One current dispute relates to the use of nitrates in agriculture. At the dawn of the twentieth century, German chemists Fritz Haber and Carl Bosch invented a system that synthesizes ammonia to produce nitrates on an industrial scale. The compound could then be used to make fertilizers, which along with pesticides and herbicides, made large-scale, modern agriculture possible. However, when nitrates are used in excess, they can create runoff that pollutes surface- and groundwater. For example, chemical runoff has had a profound effect on the Aral Sea and the surrounding area in Kazakhstan and Uzbekistan. The Aral Sea, which was once one of the four largest lakes in the world, was crucial to irrigation projects in the former Soviet Union. But when the lake became contaminated by farm runoff, salinity increased and the lake dramatically shrank, crippling the area's fishing industry. Also, as the lakebed became exposed, dust storms spread contaminated soil, and thousands of people were forced out of the region.Grant, L. "Nitrates: Dangerous Necessity." Environmentalism @ Suite 101.com. May 7, 2011. larry-grant.suite101.com/nitr...essity-a369949. Contaminated runoff from the use of nitrates not only leads to serious consequences for the environment, but also to human health. Nitrate poisoning reduces the oxygen-carrying capacity of the blood and can be fatal to infants.US Environmental Protection Agency. "Ag 101: Nitrate." Last updated September 10, 2009. http://www.epa.gov/agriculture/ag101...ctnitrate.html. Therefore, significant efforts are being made to use nitrates and other agricultural chemicals in more environmentally friendly ways and to monitor drinking water for dangerous levels of contamination.

The Role of Government

Federal and state policy plays a major role in the politics of food production and distribution. As previously discussed, government agencies regulate the proper processing and preparation of foods, as well as overseeing shipping and storage. They pay particular attention to concerns related to public health. As a result, the enforcement of regulations has been strongly influenced by public concern over food-related events, such as outbreaks of food-bourne illnesses.

Food Production, Distribution, and Safety

Many consumers have concerns about safety practices during the production and distribution of food. This is especially critical given recent outbreaks of food-borne illnesses. For example, during fall 2011 in the United States, there was an eruption of the bacteria *Listeria monocytogenes* in cantaloupe. It was one of the deadliest outbreaks in over a decade and resulted in a number of deaths and hospitalizations.Centers for Disease Control and Prevention. "Multistate Outbreak of Listeriosis Associated with Jensen Farms Cantaloupe—United States." August–September, 2011. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6039a5.htm?s_cid= mm6039a5_w.



Figure 3.4.1: Whole chickens are suspended in a public market. (CC-BY-SA; 3.0; Tomás Castelazo)

In January 2011, the Food Safety Modernization Act was passed to grant more authority to the FDA to improve food safety. The FDA and other agencies also address consumer-related concerns about protecting the nation's food supply in the event of a terrorist attack.

Addressing Hunger

Government agencies also play an important role in addressing hunger via federal food-assistance programs. The agencies provide debit cards (formerly distributed in the form of food vouchers or food stamps) to consumers to help them purchase food and they also provide other forms of aid to low-income adults and families who face hunger and nutritional deficits. This topic will be discussed in greater detail later in this chapter.

The Dual Role of the USDA

The USDA has a dual role in the advancement of American agribusiness and the promotion of health and nutrition among the public. This can create conflicts of interest, and some question whether the USDA values the interests of the agriculture and food industries over consumer health.

However, there is no question that the USDA makes a great deal of effort to educate the public about diet and nutrition. Working with the US Department of Health and Human Services, the agency codeveloped the *Dietary Guidelines for Americans* to inform consumers about the ways their dietary habits affect their health. The USDA also implements all federal nutrition programs.

The Farm Bill

The Farm Bill (introduced in 1990) is a massive piece of legislation that determines the farm and food policy of the federal government. It addresses policy related to federal food programs and other responsibilities of the USDA. The Farm Bill also covers a wide range of agricultural programs and provisions, including farm subsidies and rural development. And, it influences international trade, commodity prices, environmental preservation, and food safety.

The massive Farm Bill is updated and renewed every five years. Over the decades, it has expanded to incorporate new issues, such as conservation and bioenergy. The Farm Bill passed in 2008, known as the Food, Conservation, and Energy Act, included new policy on horticulture and livestock provisions. The 2008 bill also differed from previous legislation in terms of the large number

and scope of proposals that were raised.Johnson, R. and J. Monke, “What Is the ‘Farm Bill’?” Congressional Research Service. *CRS Report for Congress*, no. RS22131 (January 3, 2011). www.nationalaglawcenter.org/a...rs/RS22131.pdf.

Tools for Change

Start paying attention to the news when you hear about the next upcoming Farm Bill to learn about proposals that could affect the food that arrives in your local supermarket or that is served in your favorite restaurant. To learn more about the upcoming legislation, visit http://www.usda.gov/farmbill. You may also wish to “vote with your fork” and make choices about what you eat based on practices you approve of, such as choosing a vegetarian, vegan, organic, locavore, sustainable, slow-food movement or other type of diet.

Agricultural Subsidies

The Farm Bill can directly and indirectly have wide-ranging effects. For example, the bill dictates subsidies and other forms of agricultural funding or support. Farmers rely on this kind of support to offset varying crop yields and unfavorable weather conditions. The agricultural industry also depends on the federal government to provide some form of price control to guard against flooding the market and dragging down prices. As an example, major changes in the policy of agricultural subsidies were implemented in the 1970s to increase farm incomes and produce cheaper food. As a result of these policies and subsidies, much more corn was grown, giving rise to high fructose corn syrup as a primary sweetener in a number of products today, since corn syrup is cheaper to produce. It is also sweeter than cane sugar, which encouraged its widespread use.

Historically, Congress has pursued farm support programs to ensure that the US population has continued access to abundant and affordable food. However, some leaders worry about the effectiveness of government programs as well as the cost to taxpayers and consumers. Others question if continued farm support is even needed and wonder if it remains compatible with current economic objectives, domestic policy, trade policy, and regulatory restrictions.Johnson, R. and J. Monke, “What Is the ‘Farm Bill’?” Congressional Research Service. *CRS Report for Congress*, no. RS22131 (January 3, 2011). www.nationalaglawcenter.org/a...rs/RS22131.pdf. For example, federal dairy policies can raise the price of milk and other dairy products, which can detrimentally affect school lunch and food stamp programs. Regarding all of these issues, Congress must heed the demands of its constituents. In the end, it is inevitable that consumers’ growing interest in food issues will affect not only the choices they make in the grocery store, but also the decisions they make in the voting booth.

Key Takeaways

Food politics reflect changing perspectives and policies in the areas of production, distribution, marketing, regulation, and consumption. Over the years, there have been a number of controversies and disputes over food, including concerns about additives and GM foods, the push for sustainable agriculture, and the need to alleviate hunger. In the United States, a massive piece of legislation known as the Farm Bill determines the agricultural and food policy of the federal government.

Discussion Starter

1. Debate a controversial issue related to food politics, such as sustainable agriculture, farm subsidies, or the Farm Bill. Identify the stakeholders involved with the issue and discuss the pros and cons of the differing sides.

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3.5: Food Cost and Inflation

Learning Objectives

- Cite a recent event that has had a profound effect on how consumers feel about the food supply.
- Give a historical overview of the era of cheap food.

Statistics show that Americans spend more than $1.5 trillion on food each year at supermarkets, in restaurants, and from other food providers.Plunkett Research, Ltd. “US Food Industry Overview.” 2011. http://www.plunkettresearch.com/food...ocery%20market%20research/industry%20statistics. According to the USDA, a thrifty family of four spends about $540-$620 per month on groceries.US Department of Agriculture. “Official USDA Food Plans: Cost of Food at Home at Four Levels, US Average, August 2011.” Issued September 2011. www.cnpp.usda.gov/Publication...oodAug2011.pdf. A number of factors affect the rising cost of food. They include agricultural production, processing and manufacturing, wholesale distribution, retail distribution, and consumption.

Around the world, commodity prices rose sharply in 2010 as crop production shortfalls led to reduced supplies and a higher volatility in agricultural markets. Other factors that played a role in increasing food prices include a population boom that has drastically increased demand, droughts and other natural disasters that have crippled farmers, and trade policies and practices that are unfair to developing nations.

Rising agricultural commodity prices have led to concerns about food insecurity and hunger. In an agricultural outlook report for 2010–2020, the Secretary-General of the Organisation for Economic Co-operation and Development states, “While higher prices are generally good news for farmers, the effect on the poor in developing countries who spend a high proportion of their income on food can be devastating. That is why we are calling on governments to improve information and transparency of both physical and financial markets, encourage investments that increase productivity in developing countries, remove production and trade distorting policies, and assist the vulnerable to better manage risk and uncertainty.”Organisation for Economic Co-operation and Development. “OECD-FAO Agricultural Outlook 2010–2020.” June 17, 2011. www.oecd.org/document/31/0,37..._1_1_1,00.html.

Who Bears the Cost?

The cost of our food is influenced by the policies and practices of farms, food and beverage companies, food wholesalers, food retailers, and food service companies. These costs include the energy required to produce and distribute food products from farm field to supermarket to table. Rising prices also reflect the marketing and advertising of food. All of these factors affect all participants in a food system, but some participants are more affected than others. A 2011 report by the Economic Research Service of the USDA shows the division of the consumer food dollar among various aspects of the American food system. A far greater amount of the money you spend to buy a product goes toward the marketing components than toward the actual farmer.US Department of Agriculture, Economic Research Service. “Overview.” Last updated November 19, 2012. http://www.ers.usda.gov/data-product...enditures.aspx.

The Consumer Price Index

The Consumer Price Index (CPI) measures changes in the price level paid for goods and services. This economic indicator is based on the expenditures of the residents of urban areas, including working professionals, the self-employed, the poor, the unemployed, and retired workers, as well as urban wage earners and clerical workers. The CPI has subindices for many different types of products, including food and beverages. It is a closely-watched statistic that is used in a variety of ways, including measuring inflation and regulating prices.

Implications Around the World

Food prices and inflation disproportionately affect people at lower income levels. For the poorest people of the world, increasing prices can raise levels of hunger and starvation. In many developing countries where the cost for staple crops steadily rises, consumers have faced shortages or even the fear of shortages, which can result in hoarding and rioting. This happened in 2007 and 2008 during rice shortages in India and other parts of Asia. Rioters burned hundreds of food ration stores in the Indian region West Bengal. In the West African nation Burkina Faso, food rioters looted stores and burned government buildings as a result of rising prices for food and other necessities.Vivienne Walt, “The World’s Growing Food-Price Crisis,” *Time* Magazine, 27 February 2008. www.time.com/time/world/artic...7572-1,00.html. In some poor countries, protests also have been fueled by concerns over

corruption, because officials earned fortunes from oil and minerals, while locals struggled to put food on their tables. Bringing down prices would quell protests, but could take a decade or more to accomplish.

The End of the Era of Cheap Food

Concerns about food shortages and rising prices reflect the end of the era of cheap food. Following World War II, grain prices fell steadily around the world for decades. As farms grew in scale, factory-farm practices, such as the use of synthetic and mined fertilizers and pesticides, increased. Agribusinesses also invested in massive planting and harvesting machines. These practices pushed crop yields up and crop prices down. Food became so inexpensive that we entered what came to be called the "era of cheap food."

However, by 2008, economic experts had declared that the era of cheap food was over. The rapid growth in farm output had slowed to the point that it failed to keep pace with population increases and rising affluence in once-developing nations. Consumption of four staples—wheat, rice, corn, and soybeans—outstripped production and resulted in dramatic stockpile decreases. The consequence of this imbalance has been huge spikes felt moderately in the West and to a much greater degree in the developing world. As a result, hunger has worsened for tens of millions of poor people around the world.Justin Gillis, "A Warming Planet Struggles to Feed Itself," *The New York Times*, 4 June 2011. http://www.nytimes.com/2011/06/05/sc...t.html?_r=2&hp.

Two major trends played a part in this shift. First, prosperity in India and China led to increased food consumption in general, but more specifically to increased meat consumption. Increased meat consumption has led to an increased demand for livestock feed, which has contributed to an overall rise in prices. The second trend relates to biofuels, which are made from a wide variety of crops (such as corn and palm nuts), which increasingly are used to make fuel instead of to feed people.

The world population in 2010 was 6.9 billion.United Nations. "World Population Prospects, the 2010 Revision." http://esa.un.org/wpp/Analytical-Fig.../htm/fig_1.htm. It is projected to grow to 9.4 billion by 2050.Food and Agricultural Organization of the United Nations. "Executive Summary." www.fao.org/docrep/004/y3557e/y3557e03.htm. The rate of increase is particularly high in the developing world, and the increased population, along with poverty and political instability, are helping to foster long-term food insecurity. In the coming decades, farmers will need to greatly increase their output to meet the rising demand, while adapting to any future trends.Christian Science Monitor. "Why the Era of Cheap Food Is Over." December 31, 2007. http://www.csmonitor.com/2007/1231/p13s01-wogi.html.

Key Takeaways

Food prices are rising in the United States and around the world, which has greatly affected both agricultural producers and consumers. A number of factors have contributed to rising costs, including population booms, natural disasters, and the production of biofuels, among others. Economic experts have declared that the era of cheap food, which began after World War II, has ended due to rising population rates and decreased agricultural production worldwide. As a result, hunger has worsened for tens of millions of poor people globally.

Discussion Starter

1. Examine the graphics from http://www.ers.usda.gov/data-product...mentation.aspx. What does each image indicate about agriculture and the American economy?

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3.6: The Issue of Food Security

Learning Objectives

- Share an example of a food and nutrition program that seeks to mitigate hunger in the United States and/or Canada.

Physiologically, hunger relates to appetite and is the body's response to a need for nourishment. Through stomach discomfort or intestinal rumbling, the body alerts the brain that it requires food. This uneasy sensation is easily addressed with a snack or a full meal. However, the term "hunger" also relates to a weakened condition that is a consequence of a prolonged lack of food. People who suffer from this form of hunger typically experience malnourishment, along with poor growth and development.

Hunger

Adequate food intake that meets nutritional requirements is essential to achieve a healthy, productive lifestyle. However, millions of people in North America, not to mention globally, go hungry and are malnourished each year due to a recurring and involuntary lack of food. The economic crisis of 2008 caused a dramatic increase in hunger across the United States.World Hunger.org. "Hunger in America: 2011 United States Hunger and Poverty Facts." Accessed October 10, 2011. www.worldhunger.org/articles/...nger_facts.htm.

Key Hunger Statistics

In 2010, 925 million people around the world were classified as hungry. Although this was a decrease from a historic high of more than one billion people from the previous year, it is still an unbearable number. Every night, millions and millions of people go to sleep hungry due to a lack of the money or resources needed to acquire an adequate amount of food. This graph shows the division of hungry people around the globe.

Key Hunger Terms

A number of terms are used to categorize and classify hunger. Two key terms, food security and food insecurity, focus on status and affect hunger statistics. Another term, malnutrition, refers to the deficiencies that a hungry person experiences.

Food Security

Most American households are considered to be food secure, which means they have adequate access to food and consume enough nutrients to achieve a healthy lifestyle. However, a minority of US households experiences food insecurity at certain points during the year, which means their access to food is limited due to a lack of money or other resources. This graphic shows the percentage of food-secure and food-insecure households in the United States during the year 2010.

Food Insecurity

Food insecurity is defined as not having adequate access to food that meets nutritional needs. According to the USDA, about 48.8 million people live in food-insecure households and have reported multiple indications of food access problems. About sixteen million of those have "very low food security," which means one or more people in the household were hungry at some point over the course of a year due to the inability to afford enough food. The difference between low and very low food security is that members of low insecurity households have reported problems of food access, but have reported only a few instances of reduced food intake, if any.Coleman-Jensen, A. et al. "Household Food Security in the United States in 2010." US Department of Agriculture, *Economic Research Report*, no. ERR-125 (September 2011). African American and Hispanic households experience food insecurity at much higher rates than the national average.Coleman-Jensen, A. et al. "Household Food Security in the United States in 2010." US Department of Agriculture, *Economic Research Report*, no. ERR-125 (September 2011).

Households with limited resources employ a variety of methods to increase their access to adequate food. Some families purchase junk food and fast food—cheaper options that are also very unhealthy. Other families who struggle with food security supplement the groceries they purchase by participating in government assistance programs. They may also obtain food from emergency providers, such as food banks and soup kitchens in their communities.

Malnutrition

A person living in a food-insecure household may suffer from malnutrition, which results from a failure to meet nutrient requirements. This can occur as a result of consuming too little food or not enough key nutrients. There are two basic types of malnutrition. The first is macronutrient deficiency and relates to the lack of adequate protein, which is required for cell growth, maintenance, and repair. The second type of malnutrition is micronutrient deficiency and relates to inadequate vitamin and mineral intake.World Hunger. "2011 World Hunger and Poverty Facts and Statistics." Accessed October 10, 2011. http://www.worldhunger.org/articles/...cts%202002.htm. Even people who are overweight or obese can suffer from this kind of malnutrition if they eat foods that do not meet all of their nutritional needs.

At-Risk Groups

Worldwide, three main groups are most at risk of hunger: the rural poor in developing nations who also lack access to electricity and safe drinking water, the urban poor who live in expanding cities and lack the means to buy food, and victims of earthquakes, hurricanes, and other natural and man-made catastrophes.Food and Agriculture Organization of the United Nations. "Hunger: Frequently Asked Questions." Accessed October 10, 2011. www.fao.org/hunger/en/ In the United States, there are additional subgroups that are at risk and are more likely than others to face hunger and malnutrition. They include low-income families and the working poor, who are employed but have incomes below the federal poverty level.

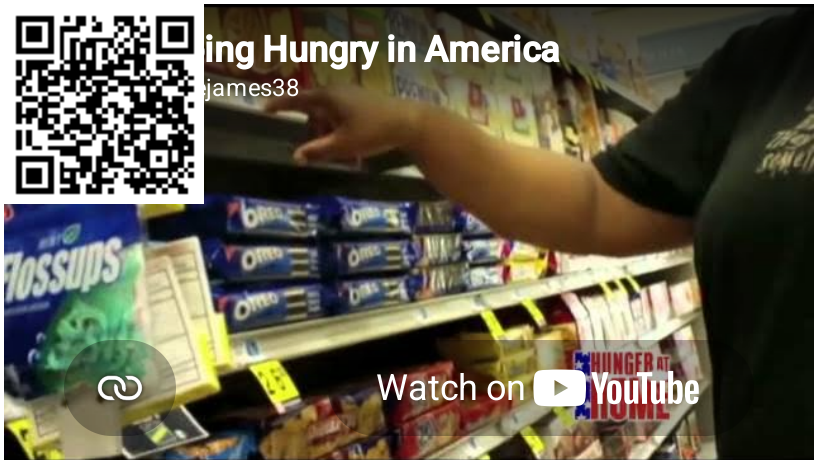
Senior citizens are also a major at-risk group. Many elderly people are frail and isolated, which affects their ability to meet their dietary requirements. In addition, many also have low incomes, limited resources, and difficulty purchasing or preparing food due to health issues or poor mobility. As a result, more than six million senior citizens in the United States face the threat of hunger. Meals on Wheels. "Our Vision and Mission." Accessed October 10, 2011. www.mowaa.org/page.aspx?pid=299

The Homeless

One of the groups that struggles with hunger are the millions of homeless people across North America. According to a recent study by the US Conference of Mayors, the majority of reporting cities saw an increase in the number of homeless families.The United States Conference of Mayors. "Hunger and Homelessness Survey: A Status Report on Hunger and Homelessness in America's Cities, a 27-City Survey." December 2009. usmayors.org/pressreleases/up...eteWEB2009.pdf. Hunger and homelessness often go hand-in-hand as homeless families and adults turn to soup kitchens or food pantries or resort to begging for food.

Children

Rising hunger rates in the United States particularly affect children. Nearly one out of four children, or 21.6 percent of all American children, lives in a food-insecure household and spends at least part of the year hungry.Coleman-Jensen, A. et al. "Household Food Security in the United States in 2010." US Department of Agriculture, *Economic Research Report*, no. ERR-125 (September 2011). Hunger delays their growth and development and affects their educational progress because it is more difficult for hungry or malnourished students to concentrate in school. In addition, children who are undernourished are more susceptible to contracting diseases, such as measles and pneumonia.World Hunger. "2011 World Hunger and Poverty Facts and Statistics." Accessed October 10, 2011.



Video 3.6.1: Going Hungry in America. This video examines the effect of hunger on many American children.

Government Programs

The federal government has established a number of programs that work to alleviate hunger and ensure that many low-income families receive the nutrition they require to live a healthy life. A number of programs were strengthened by the passage of the Healthy, Hunger-Free Kids Act of 2010. This legislation authorized funding and set the policy for several key core programs that provide a safety net for food-insecure children across the United States.

The Federal Poverty Level

The federal poverty level (FPL) is used to determine eligibility for food-assistance programs. This monetary figure is the minimum amount that a family would need to acquire shelter, food, clothing, and other necessities. It is calculated based on family size and is adjusted for annual inflation. Although many people who fall below the FPL are unemployed, the working poor can qualify for food programs and other forms of public assistance if their income is less than a certain percentage of the federal poverty level, along with other qualifications.

USDA Food Assistance Programs

Government food and nutrition assistance programs that are organized and operated by the USDA work to increase food security. They provide low-income households with access to food, the tools for consuming a healthy diet, and education about nutrition. The USDA monitors the extent and severity of food insecurity via an annual survey. This contributes to the efficiency of food assistance programs as well as the effectiveness of private charities and other initiatives aimed at reducing food insecurity.Coleman-Jensen, A. et al. “Household Food Security in the United States in 2010.” US Department of Agriculture, *Economic Research Report*, no. ERR-125 (September 2011).

The Supplemental Nutrition Assistance Program

Formerly known as the Food Stamp Program, the Supplemental Nutrition Assistance Program (SNAP) provides monthly benefits for low-income households to purchase approved food items at authorized stores. Clients qualify for the program based on available household income, assets, and certain basic expenses. In an average month, SNAP provides benefits to more than forty million people in the United States.Coleman-Jensen, A. et al. “Household Food Security in the United States in 2010.” US Department of Agriculture, *Economic Research Report*, no. ERR-125 (September 2011).

The program provides Electronic Benefit Transfers (EBT) which work similarly to a debit card. Clients receive a card with a certain allocation of money for each month that can be used only for food. In 2010, the average benefit was about $134 per person, per month and total federal expenditures for the program were $68.2 billion.Coleman-Jensen, A. et al. “Household Food Security in the United States in 2010.” US Department of Agriculture, *Economic Research Report*, no. ERR-125 (September 2011).

The Special, Supplemental Program for Women, Infants, and Children

The Special, Supplemental Program for Women, Infants and Children (WIC) provides food packages to pregnant and breastfeeding women, as well as to infants and children up to age five, to promote adequate intake for healthy growth and development. Most state WIC programs provide vouchers that participants use to acquire supplemental packages at authorized stores. In 2010, WIC served approximately 9.2 million participants per month at an average monthly cost of about forty-two dollars per person.Coleman-Jensen, A. et al. “Household Food Security in the United States in 2010.” US Department of Agriculture, *Economic Research Report*, no. ERR-125 (September 2011).

The National School Lunch Program

The National School Lunch Program (NSLP) and School Breakfast Program (SBP) ensure that children in elementary and middle schools receive at least one healthy meal each school day, or two if both the NSLP and SBP are provided. According to the USDA, these programs operate in over 101,000 public and nonprofit private schools and residential child-care institutions.US Department of Agriculture. “National School Lunch Program.” October 2011. www.fns.usda.gov/cnd/Lunch/Ab...PFactSheet.pdf. In 2010, the programs provided meals to an average of 31.6 million children each school day. Fifty-six percent of the lunches served were free, and an additional 10 percent were provided at reduced prices.

Other Food-Assistance Programs for Children

Other government programs provide meals for children after school hours and during summer breaks. The Child and Adult Care Food Program (CACFP) offers meals and snacks at child-care centers, daycare homes, and after-school programs. Through

CACFP, more than 3.2 million children and 112,000 adults receive nutritious meals and snacks each day.US Department of Agriculture. “Child & Adult Care Food Program.” Last modified June 10, 2011. www.fns.usda.gov/cnd/care/. The Summer Food Service Program provides meals to children during summer break. Sponsors include day camps and other recreation programs where at least half of the attendees live in households with incomes below the federal poverty level.US Department of Agriculture. “Summer Food Service Program.” st.TER 14 2011r Congressbrary. Last modified July 20, 2011. http://www.summerfood.usda.gov/default.htm. These and other programs help to fill in the gaps during the typical day of a food-insecure child.

The Head Start Program

Head Start is a health and development program for children ages three to five, from low-income families. The philosophy behind the organization is that early intervention can help address the educational, social, and nutritional deficiencies that children from lower-income families often experience. Launched in 1965, it is one of the longest-running, poverty-related programs in the United States. Today, Head Start programs include education, meals, snacks, and access to other social services and health guidance.US Department of Health and Human Services. “About the Office of Head Start.” Last reviewed February 23, 2011. www.acf.hhs.gov/programs/ohs/about/index.html.

Other Forms of Assistance

Other forms of assistance include locally-operated charitable organizations, such as food banks and food pantries, which acquire food from local manufacturers, retailers, farmers, and community members to give to low-income families. Neighborhood soup kitchens provide meals to the homeless and other people in need. These and other organizations are run by nonprofit groups, as well as religious institutions, to provide an additional safety net for those in need of food.

Meals on Wheels

An organization known as Meals on Wheels delivers meals to elderly people who have difficulty buying or making their own food because of poor health or limited mobility. It is the oldest and largest program dedicated to addressing the nutritional needs of senior citizens. Each day, Meals on Wheels volunteers deliver more than one million meals across the United States. The first Meals on Wheels program began in Philadelphia in the 1950s. In the decades since, the organization has expanded into a vast network that serves the elderly in all fifty states and several US territories. Today, Meals on Wheels remains committed to ending hunger among the senior citizen community.Meals on Wheels. “The Meals on Wheels Association of America.” Accessed October 10, 2011. www.mowaa.org/page.aspx?pid=212.



Figure 3.6.1: Delivery of Thanksgiving dinner to a Meals on Wheels recipient. Clara Donney, (right), a Meals on Wheels recipient of a Thanksgiving dinner sponsored by the Great Falls Community Food Bank, is all smiles as Airman 1st Class Courtney Taylor, customer service technician with the 341st Comptroller Squadron, delivers her meal. (Public Domain; US Air Force).

Key Takeaways

Around the world, nearly one billion people suffer the effects of constant hunger. Key terms related to hunger include food security, which means having continual access to safe, sufficient, nutritious food, and food insecurity, which means not having continual

access to safe, sufficient, nutritious food. There are two types of malnutrition. The first is macronutrient deficiency and relates to the lack of adequate protein, which is required for cell growth, maintenance, and repair. The second type of malnutrition is micronutrient deficiency and relates to inadequate vitamin and mineral intake. There are a number of groups at risk for hunger, including the unemployed and underemployed, poor families, the elderly, and the homeless. The United States has a number of federal and state programs, as well as local charities, which provide assistance and education for people who fall into the category of food insecurity.

Discussion Starter

1. Do you believe there are enough government programs currently in place to address the problem of hunger? Why or why not? If not, what additional solutions would you recommend?

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3.7: Nutrition and Your Health

Learning Objectives

- Relate the research on home-cooked family meals to comprehensive health and wellness, taste, sustainability, and the strengthening of family bonds

The adage, “you are what you eat,” seems to be more true today than ever. In recent years, consumers have become more conscientious about the decisions they make in the supermarket. Organically grown food is the fastest growing segment of the food industry. Also, farmers’ markets and chains that are health-food-oriented are thriving in many parts of North America. Shoppers have begun to pay more attention to the effect of food on their health and well-being. That includes not only the kinds of foods that they purchase, but also the manner in which meals are cooked and consumed. The preparation of food can greatly affect its nutritional value. Also, studies have shown that eating at a table with family members or friends can promote both health and happiness.

Family Meals

In the past, families routinely sat down together to eat dinner. But in recent decades, that comfortable tradition has fallen by the wayside. In 1900, 2 percent of meals were eaten outside of the home. By 2010, that figure had risen to 50 percent. Mark Hyman, MD, “How Eating at Home Can Save Your Life,” Huffington Post.com, 9 January 2011. http://www.huffingtonpost.com/dr-mar...ily-dinner-how _b_806114.html? Today, family members often go their own way at mealtimes and when they do sit down together, about three times a week, the meal often lasts less than twenty minutes and is spent eating a microwaved meal in front of a television.

However, recent studies have shown that home-cooked, family meals really matter. Family meals usually lead to the consumption of healthy food packed with nutrition, rather than an intake of empty calories. Other benefits include strengthening familial bonds, improving family communication, and helping young children learn table manners. Increased frequency of family meals has also been associated with certain developmental assets, such as support, boundaries and expectations, commitment to learning, positive values, and social competency.Rochford, M. “Do Family Meals Still Matter?” *Visions: Family and Community Health Sciences* (Rutgers University) 21, no. 3 (2009).

Home-prepared meals provide an opportunity for more balanced and better-portioned meals with fewer calories, sodium, and less saturated fat. When families prepare food together, parents or caregivers can also use the time to teach children about the ways their dietary selections can affect their health.

The Adolescent Diet

Teenagers’ dietary choices are influenced by their family’s economic status, the availability of food inside and outside the home, and established traditions. Studies have found links between the prevalence of family meals during adolescence and the establishment of healthy dietary behaviors by young adulthood. Yet, many of today’s teenagers make food selections on their own, which often means eating junk food or fast food on the go.

However, adolescents who regularly consume family meals or have done so in the past are more likely to eat breakfast and to eat more fruits and vegetables. Research has shown that adolescents who have regular meals with their parents are 42 percent less likely to drink alcohol, 50 percent less likely to smoke cigarettes, and 66 percent less likely to use marijuana. Regular family dinners also help protect teens from bulimia, anorexia, and diet pills. In addition, the frequency of family meals was inversely related to lower academic scores and incidents of depression or suicide.Mark Hyman, MD, “How Eating at Home Can Save Your Life,” Huffington Post.com, 9 January 2011. http://www.huffingtonpost.com/dr-mar...ily-dinner-how _b_806114.html?

Sustainable Eating

As discussed at the beginning of this chapter, sustainable agricultural practices provide healthy, nutritious food for the consumers of today, while preserving natural resources for the consumers of tomorrow. Sustainability not only has economic and environmental benefits, but also personal benefits, including reduced exposure to pesticides, antibiotics, and growth hormones. Sustainable eaters do all of the following:

- **Consume less processed food.** People who eat sustainably focus on whole foods that are high in nutritive value, rather than heavily processed foods with lots of additives.
- **Eat more home-cooked meals.** Sustainable eaters go out to restaurants less often, and when they do, they dine at establishments that provide dishes made from whole-food ingredients.
- **Consume a plant-based diet.** Research has shown that a plant-based diet, focused on whole grains, vegetables, fruits, and legumes, greatly reduces the risk of heart disease.
- **Buy 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.
- **Buy locally grown foods.** Buying locally benefits the environment by reducing the fossil fuels needed to transport food from faraway places. Also, farmers keep eighty to ninety cents for every dollar spent at a farmer's market.

Disease Prevention and Management

Eating fresh, healthy foods not only stimulates your taste buds, but also can improve your quality of life and help you to live longer. As discussed, food fuels your body and helps you to maintain a healthy weight. Nutrition also contributes to longevity and plays an important role in preventing a number of diseases and disorders, from obesity to cardiovascular disease. Some dietary changes can also help to manage certain chronic conditions, including high blood pressure and diabetes. A doctor or a nutritionist can provide guidance to determine the dietary changes needed to ensure and maintain your health.

Heart Health

According to the WHO, cardiovascular disease is the leading cause of death on the planet.World Health Organization. "The Top 10 Causes of Death." Accessed http://www.who.int/mediacentre/factsheets/fs310/en/. However, a healthy diet can go a long way toward preventing a number of conditions that contribute to cardiovascular malfunction, including high levels of blood cholesterol and narrowed arteries. As discussed in this text, it is extremely helpful to reduce the intake of trans fat, saturated fat, and sodium. This can considerably lower the risk of cardiovascular disease, or manage further incidents and artery blockages in current heart patients. It is also beneficial to eat a diet high in fiber and to include more omega-3 fatty acids, such as the kind found in mackerel, salmon, and other oily fish.

High Blood Pressure

Blood pressure is the force of blood pumping through the arteries. When pressure levels become too high, it results in a condition known as hypertension, which is asymptomatic but can lead to a number of other problems, including heart attacks, heart failure, kidney failure, and strokes. For people with high blood pressure, it can be beneficial to follow the same recommendations as those for heart patients. First of all, it is crucial to reduce the intake of sodium to prevent pressure levels from continuing to rise. It can also be helpful to increase potassium intake. However, patients should check with a doctor or dietitian first, especially if there are kidney disease concerns.

Tools for Change

The Dietary Approaches to Stop Hypertension, or DASH diet, is highly recommended to lower blood pressure. This program promotes an increased intake of potassium and calcium by emphasizing fruits, vegetables, whole grains, low-fat dairy products, and limited amounts of lean meat. The DASH diet also decreases the intake of saturated fat and sugar. Studies have shown that blood-pressure patients on the DASH diet were able to reduce their diastolic pressure levels (the lower measurement, which is taken between beats when the heart is relaxed) by up to 5 mmHg regardless of age, gender, or ethnicity. You can learn more about the DASH diet at http://dashdiet.org/.

Diabetes

The rising rates of diabetes have triggered a health crisis in the United States and around the world. In diabetics, the levels of blood glucose, or blood sugar, are too high because of the body's inability to produce insulin or to use it effectively. There are two types of this disease. Although the causes of Type 1 diabetes are not completely understood, it is known that obesity and genetics are major factors for Type 2.

Nutrition plays a role in lowering the risk of Type 2 diabetes or managing either form of the disease. However, it is a myth that there is one diabetes diet that every patient should follow. Instead, diabetics should keep track of the foods they consume that contain carbohydrates to manage and control blood-glucose levels. Also, a dietitian can help patients create a specific meal plan that fits their preferences, lifestyle, and health goals.

The Crisis of Obesity

Excessive weight gain has become an epidemic. According to the National Institutes of Health, over two-thirds of American adults are overweight, and one in three is obese. Obesity in particular puts people at risk for a host of complications, including Type 2 diabetes, heart disease, high cholesterol, hypertension, osteoarthritis, and some forms of cancer. The more overweight a person is, the greater his or her risk of developing life-threatening complications. There is no single cause of obesity and no single way to treat it. However, a healthy, nutritious diet is generally the first step, including consuming more fruits and vegetables, whole grains, and lean meats and dairy products.National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health. "Overweight and Obesity Statistics." *NIH Publication No. 04-4158*. Updated February 2010. win.niddk.nih.gov/publication...s/stat904z.pdf.

Kidney Disease

Chronic kidney failure is the gradual loss of kidney function and can cause dangerous levels of fluid and waste to build up in the body. Nutrition is very important in managing end-stage renal disease, and a patient with this condition should discuss a meal plan with a dietitian and physician. Certain macro- and micronutrients will need to be monitored closely, including protein, potassium, sodium, and phosphorus. Kidney patients must also keep track of their caloric intake and dietitians may recommend consuming more fast-releasing carbohydrates and low-saturated fats to boost the number of calories consumed each day.

Cancer

Certain cancers are linked to being overweight or obese. Additionally, some foods are related to either an increased or decreased risk for certain cancers. Foods linked to decreased cancer risk include whole grains, high-fiber foods, fruits, and vegetables. Foods linked to increased cancer risk include processed meats and excess alcohol.

Digestive Disorders

Digestive disorders can include constipation, heartburn or gastroesophageal reflux disease, inflammatory bowel disease, including Crohn's and ulcerative colitis, and irritable bowel syndrome. These disorders should be addressed with a physician. However, for many of them, diet can play an important role in prevention and management. For example, getting enough fiber and fluids in your diet and being active can help to alleviate constipation.

Key Takeaways

More and more consumers are weighing nutritional considerations as they choose which foods to purchase and prepare for their families. Studies have shown that family meals and home-cooked food not only benefit a person's health, but also their overall well-being. Family meals lead to the consumption of healthy food, tighter familial bonds, improved communication, and the teaching of table manners to young children. Diet plays a key role in the prevention and management of many chronic conditions or diseases, such as hypertension and diabetes.

Discussion Starter

1. What would you recommend to help people who are struggling with diabetes? What tips would you provide? What lifestyle changes might help? Use the dietary guidelines at the Mayo Clinic's website to help provide specific suggestions. www.mayoclinic.com/health/dia...s-diet/DA00027.

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3.8: Diets around the World

Learning Objectives

- Give examples of how local taste preferences and availability influence food choices in different regions of the globe.
- Explain what is meant by Alice Waters' statement: "Food is precious."

In the past, people's culture and location determined the foods they ate and the manner in which they prepared their meals. For example, in the Middle East, wheat was a staple grain and was used to make flatbread and porridge, while halfway around the world in Mesoamerica, maize was the staple crop and was used to make tortillas and tamales. Today, most people have access to a wide variety of food and can prepare them any way they choose. However, customs and traditions still strongly influence diet and cuisine in most areas of the world.

Comparing Diets

There are a multitude of diets across the globe, in all regions and cultures. Each is influenced by the traditions of the past, along with the produce and livestock available. Local tastes, agricultural economics, and incomes still have a profound effect on what many people eat around the world. In this section, you will read a few examples of cuisines in different countries and regions, demonstrating differences in preferences. We will also compare common dietary choices in each region for a key meal—breakfast.

North America

The people of the United States and Canada consume a wide variety of food. Throughout both countries, people enjoy eating all kinds of cuisine from barbecue, pizza, peanut butter sandwiches, and pie to sushi, tacos, chow mein, and roti (an Indian flatbread). This is partly due to the influence of immigration. As people emmigrated to North America, they brought their dietary differences with them. In the 1800s, for example, Italian immigrants continued to cook spaghetti, pesto, and other cultural dishes after arriving in the United States. Today, Italian cuisine is enjoyed by many Americans from all backgrounds.

The variety of North American cuisine has also been impacted by regional variations. For example, fried chicken, cornbread, and sweet tea are popular in the southern states, while clam chowder, lobster rolls, and apple cider are enjoyed in New England. Also, as more people seek to support sustainable agriculture, locally grown crops and whole-food cooking practices often factor into what Americans eat and how they eat it.

Breakfast in North America

Meals can vary widely from one region of the world to another. Therefore, it can be interesting and informative to compare the choices made for a particular meal around the globe. Throughout this section, we will explore the kinds of foods that people consume as they begin their day. Breakfast is a vital meal in any part of the world because it breaks the long overnight fast. An adequate breakfast also provides fuel for the first part of the day and helps improve concentration and energy levels.

Let's begin with breakfast in North America. On weekdays, North Americans often eat breakfast in a hurry or on the go. Therefore, many people choose breakfast foods that are quick and easy to prepare or can be eaten during the trip to school or the office. As a result, breakfast cereals with milk are extremely popular, and also oatmeal, toast, or bagels. However, on the weekends, some people spend a longer time enjoying a hearty breakfast or going out for brunch. Typical choices emphasize hot foods and include egg dishes, such as omelettes and scrambled or fried eggs, along with pancakes, waffles, french toast, bacon or sausage, and orange juice, coffee, or tea to drink.

Central and South America

Both Central America and South America feature cuisines with rich Latin flavors. In addition, rice and corn are staples in both and form the basis for many dishes. Both regions are also affected by the mixture of influences from the native populations and the cultural traditions brought by Spanish and Portuguese immigrants during the 1600s and beyond.

South America has a diverse population, which is reflected in dietary choices across the continent. The northwestern region boasts some of the most exotic food in Latin America. In northeastern South America, many dishes feature a contrast of sweet and salty tastes, including raisins, prunes, capers, and olives. Also, rice grown in the area and seafood off the coast are key ingredients in South American-style paella. The north central part of the continent reflects a Spanish influence. Many of the dominant spices—cumin, oregano, cinnamon, and anise—came from Spain, along with orange and lime juices, wine, and olive oil. The south is cattle

country and the locals enjoy grass-fed beef cooked in the form of asados, which are large cuts roasted in a campfire. Another popular meat dish is parrilladas, which are thick steaks grilled over oak.Cooking Light. “South American Cuisine.” © 2012 Time Inc. Lifestyle Group. http://www.cookinglight.com/food/wor...erican-cuisine -00400000001391/.

From Mexico in the North to Panama in the South, Central American cuisine features some of the world’s favorite foods, including rice, beans, corn, peppers, and tropical fruits. This area combines a variety of culinary traditions derived from the native Maya and Aztec populations, arrivals from Spain, and African and Latin-influenced neighbors along the Caribbean. In this region of the world, tamales are common. Spicy seasonings, including hot chili peppers, are also very popular.

Typical Southern and Central American Foods

Typical foods in South and Central America include quinoa, which is a grain-like crop that is cultivated for its edible seeds. Quinoa has a high protein and fiber content, is gluten-free, and is particulary tasty cooked in pilafs. Another popular grain product is the tortilla, which is a flatbread made from wheat or corn. Tortillas are used to make a number of dishes, including burritos, enchiladas, and tacos. Fruits and vegetables that are common in Mexico, Central America, and South America include corn, avocados, yucca, peppers, potatoes, mangoes, and papayas. Rice, beans, and a soft cheese known as queso fresco are common to the cuisine in this area of the world as well.



Figure 3.8.1: Tamales, which are popular in Mexico and parts of Central and South America, are made from a shell called a masa that is stuffed with meat or vegetables and steamed or boiled in a wrapper of dried corn leaves. The wrapping is discarded prior to eating. Salvadorean tamales shown above are made in banana or plantain leaves, and the masa (corn meal) is often seasoned with chicken stock. (Public Domain; Ll1324).

Breakfast in Central America

In this region, the first meal of the day commonly includes huevos rancheros (fried eggs served over a tortilla and topped with tomato sauce). Other popular breakfast dishes include pan dulce (a sweetened bread), along with fried plantains, and a spicy sausage called chorizo. The typical beverage is coffee, which is available in many forms, including café con leche (which is sweetened with lots of milk) and café de olla (with cinnamon and brown sugar). Hot chocolate is also popular and tends to be thick, rich, and flavored with spices such as cinnamon or achiote. In the Yucatan region, huevos motulenos are prepared by spreading refried beans onto fresh tortillas with fried eggs, peas, chopped ham, and cheese.

Europe

European cuisine is extremely diverse. The diet in Great Britain is different from what people typically consume in Germany, for example. However, across the continent, meat dishes are prominent, along with an emphasis on sauces. Potatoes, wheat, and dairy products are also staples of the European diet.

The nations along the Mediterranean Sea are particularly renowned for their flavorful food. This part of the world boasts a number of famous dishes associated with their countries of origin. They include Italy’s pasta, France’s coq au vin, and Spain’s paella.

Italy

Although Italy is a relatively small nation, the difference in cuisine from one region to another can be great. For example, the people of northern Italy tend to rely on dairy products such as butter, cream, and cheeses made from cow's milk, because the land is flatter and better suited to raising cattle. In southern Italy, there is greater reliance on olive oil than butter, and cheeses are more likely to be made from sheep's milk.Cooking Light. "Regional Italian Cuisine." © 2012 Time Inc. Lifestyle Group. http://www.cookinglight.com/food/wor...talian-cuisine -00400000001340/.

However, there are a number of common ingredients and dishes across the country. Italian cuisine includes a variety of pasta, such as spaghetti, linguine, penne, and ravioli. Other well-known dishes are pizza, risotto, and polenta. Italians are also known for cooking with certain spices, including garlic, oregano, and basil.

France

For centuries, the French have been famous for their rich, extravagant cuisine. Butter, olive oil, pork fat, goose fat, and duck fat are all key ingredients. Common French dishes include quiche, fondue, baguettes, and also creams and tarts. Frites, or French fries, are cut in different shapes and fried in different fats, depending on the region. Fresh-baked bread is also found across the nation from the skinny baguettes of Paris to the sourdough breads in other parts of the country.

Every region of France seems to have its version of coq au vin (braised chicken most often cooked with garlic, mushrooms, and pork fat in wine). For instance, in the northeast, the dish is prepared a la biere (in beer). In Normandy in the northwest, coq au vin is cooked au cidre (in apple cider).Cooking Light. "France's Regional Cuisine." © 2012 Time Inc. Lifestyle Group. http://www.cookinglight.com/food/wor...gional-cuisine -00400000001365/.

Spain

One of the most popular Spanish dishes is paella, a gumbo of rice, seafood, green vegetables, beans, and various meats. The ingredients can vary wildly from one region to another, but rice is always the staple of the dish. Spain is also renowned for its tapas, which are appetizers or snacks. In restaurants that specialize in preparing and serving tapas, diners often order a number of different dishes from a lengthy menu and combine them to make a full meal.

Cooks in Spain rely on a variety of olive oils known for their flavors, ranging from smooth and subtle to fruity and robust. Spanish cuisine combines Roman, Moorish, and New World flavors. Key ingredients include rice, paprika, saffron, chorizo, and citrus fruits.Cooking Light. "Spanish Flavor." © 2012 Time Inc. Lifestyle Group. http://www.cookinglight.com/food/wor...alties-spanish -00400000001203/.



Video 3.8.1: The Mediterranean Diet. This video shows the cultural history of the cuisine enjoyed by many people who live in the Mediterranean region of Europe.

Breakfast in Europe

In some countries, such as France, Italy, and Belgium, coffee and bread are common breakfast foods. However, the people of Great Britain and Ireland tend to enjoy a bigger breakfast with oatmeal or cold cereal, along with meats like bacon and sausage, plus eggs and toast. Tea is also popular in this area, not only for breakfast, but throughout the day. The continental-style breakfast is most

commonly associated with France and includes fresh-baked croissants, toast, or a rich French pastry called brioche, along with a hot cup of tea, coffee, or café au lait.

Africa

The continent of Africa is home to many different countries and cultural groups. This diversity is reflected in the cuisine and dietary choices of the African people. Traditionally, various African cusines combine locally grown cereals and grains, with fruits and vegetables. In some regions, dairy products dominate, while in others meat and poultry form the basis of many dishes.

Ethiopia

Ethiopia, located along the Horn of Africa, is one of the few African countries never colonized by a foreign nation prior to the modern era. So, outside influences on the culture were limited. Religious influences from Jewish, Islamic, and Catholic traditions played a larger role on the shaping of Ethiopian cuisine, because of the need to adhere to different dietary restrictions. For example, approximately half of Ethiopians are Muslim and must abstain from eating pork or using spices and nuts to flavor dishes. Ethiopia is also known for dishes that use local herbs and spices, including fenugreek, cumin, cardamom, coriander, saffron, and mustard. Many dishes also reflect a history of vegetarian cooking since meat was not always readily available.Cooking Light. “Ethiopian Tastes.” © 2012 Time Inc. Lifestyle Group. http://www.cookinglight.com/food/veg...0400000037116/.

In addition, Ethiopians use their hands to eat. First, diners tear off pieces of injera, a spongy, tangy flatbread made from teff flour. Then, they use the pieces as utensils to scoop up vegetables, legumes, and meats from a communal plate.Ethiopian Restaurant.com. “Injera.” © 2004–2012. http://www.ethiopianrestaurant.com/injera.html Teff is a grass that grows in the highlands of Ethiopia and is a staple of the diet.

Central and West Africa

Stretching from mountains in the north to the Congo River, Central Africa primarily features traditional cuisine. Meals are focused on certain staples, including cassava, which is a mashed root vegetable, and also plantains, peanuts, and chili peppers. In West Africa, which includes the Sahara Desert and Atlantic coast, the cuisine features dishes made from tomatoes, onions, chili peppers, and palm nut oil. Popular dishes in both regions include stews and porridges, such as ground nut stew made from peanuts, and also fufu, a paste made from cassava or maize.

Breakfast in Africa

African breakfast choices are strongly influenced by the colonial heritage of a region. The people of West Africa typically enjoy the French continental-style breakfast. However, in the eastern and southern parts of the continent, the traditional English breakfast is more common. In North Africa, breakfast is likely to include tea or coffee, with breads made from sorghum or millet. In East and West Africa, a common breakfast dish is uji, a thick porridge made from cassava, millet, rice, or corn. Kitoza is a delicacy made from dried strips of beef that are eaten with porridge in Madagascar. In Algeria, French bread, jam, and coffee is a typical breakfast. The people of Cameroon eat beignets, which is a doughnut eaten with beans or dipped in a sticky, sugary liquid called bouilli.

Asia

Asia is a massive continent that encompasses the countries of the Middle East, parts of Russia, and the island nations of the southeast. Due to this diversity, Asian cuisine can be broken down into several regional styles, including South Asia, which is represented for our purposes here by India, and East Asia which is represented for our purposes by China, Korea, and Japan. Even with this variety, the Asian nations have some dietary choices in common. For example, rice is a staple used in many dishes across the continent.

India

In India, there is much variety between the different provinces. The nation’s many kinds of regional cuisines can date back thousands of years and are influenced by geography, food availability, economics, and local customs. However, vegetarian diets are common across the nation for religious reasons, among others. As a result, Indian dishes are often based on rice, lentils, and vegetables, rather than meat or poultry. Indian cooking also features spicy seasonings, including curries, mustard oil, cumin, chili pepper, garlic, ginger, and garam masala, which is a blend of several spices.Curry Dishes.com. “Guide to Easy Indian Recipes, Curry Recipes and Curry Spices.” © 2009. www.currydishes.com/. India is also known for its breads, including the flatbreads roti and chapati. Dishes that are popular not only in India but around the world include samosa, a potato-stuffed pastry; shahi paneer, a

creamy curry dish made out of soft cheese and tomato sauce; and chana masala, chickpeas in curry sauce.Food-India.com. “Your Guide to Indian Food.” © 2003–2011. http://www.food-india.com/.

China

China has the world’s most sizable population. As a result, there are many different culinary traditions across this vast country, which is usually divided into eight distinct cuisine regions. For example, Cantonese cuisine, which is also known as Guangdong, features light, mellow dishes that are often made with sauces, including sweet-and-sour sauce and oyster sauce. Cantonese-style cuisine has been popularized in Chinese restaurants around the world. Another cuisine is known as Zhejiang, which is often shortened to Zhe, and originates from a province in southern China. It features dishes made from seafood, freshwater fish, and bamboo shoots.eChinacities.com. “China’s Eight Cuisines Revealed and How to Identify Them.” ©2008–2011 www.echinacities.com/expat-co...sines-revealed -and-how-to-indentify-them.html Key ingredients that are used in several, but not all, of the different regions include rice, tofu, ginger, and garlic. Tea is also a popular choice in most parts of the country.

Chinese use chopsticks as utensils. These small tapered sticks can be made from a variety of materials, including wood, plastic, bamboo, metal, bone, and ivory. Both chopsticks are held in one hand, between the thumb and fingers, and are used to pick up food.

Korea

Korean cuisine is primarily centered around rice, vegetables, and meat. Commonly-used ingredients include sesame oil, soy sauce, bean paste, garlic, ginger, and red pepper. Most meals feature a number of side dishes, along with a bowl of steam-cooked, short grain rice. Kimchi, a fermented cabbage dish, is the most common side dish served in Korea and is consumed at almost every meal. Another signature dish, bibimbap, is a bowl of white rice topped with sautéed vegetables and chili pepper paste and can include egg or sliced meat. Bulgogi consists of marinated, barbecued beef.Korea Tourism Organization. “Food in Korea.” Accessed October 10, 2011. visitkorea.or.kr/enu/1051_Food.jsp.

Japan

As in other parts of Asia, rice is a staple in Japan, along with seafood, which is plentiful on this island nation. Other commonly-used ingredients include noodles, teriyaki sauce, dried seaweed, mushrooms and other vegetables, meat, and miso, which is soybean paste. Some favorite foods include the raw fish dishes sashimi and sushi, which are not only popular in Japan, but are also around the world. Typical beverages include green tea and also sake, which is a wine made of fermented rice.Web MD. “Diets of the World: The Japanese Diet.” © 2005–2011. http://www.webmd.com/diet/features/d...-japanese-diet.

The traditional table setting in Japan includes placing a bowl of rice on the left and a bowl of miso soup on the right side. Behind the rice and the soup are three flat plates which hold the accompanying side dishes. Similar to China, chopsticks are used in Japan and are generally placed at the front of the table setting. At school or work, many Japanese people eat out of a bento lunch box, which is a single-portion takeout or home-cooked meal. Bento boxes typically include rice, fish or meat, and cooked or pickled vegetables.

The Middle East

Middle Eastern cuisine encompasses a number of different cooking styles from Asian countries along the Mediterranean, as well as from North African nations, such as Egypt and Libya. In this part of the world, lamb is the most commonly consumed meat and is prepared in a number of ways, including as a shish kebab, in a stew, or spit-roasted. However, kosher beef, kosher poultry, and fish are eaten as well. Other staples include the fruits and vegetables that grow in the hills of many Middle Eastern countries, such as dates, olives, figs, apricots, cucumber, cabbage, potatoes, and eggplant. Common grains include couscous, millet, rice, and bulghur. Popular dishes include Syrian baba ganoush, which is pureed eggplant, and kibbeh, or lamb with bulghur wheat, from Lebanon.Saveur. “Middle Eastern Recipes.” Accessed December 5, 2011. www.saveur.com/solrSearchResu...le\%20Eastern&sitesection=recipes. A flatbread called pita served with hummus, or pureed chickpeas, is another popular dish in this region of the world.

Most people who reside in the Arab countries of the Middle East are Muslim, which can affect their diet. Many Muslims do not consume alcohol or pork. They also observe certain diet-related religious traditions, such as a daytime fast during the month of Ramadan. Other residents of the Middle East include Jews and Christians, and their traditions also affect what foods they eat and how they prepare it. For example, many Jews in Israel keep kosher and follow a set of dietary laws that impact food choices, storage, and preparation.

Breakfast in Asia

To continue the comparison of breakfast around the world, let's examine the first meal of the day in many parts of Asia. In India, the first meal of the day commonly includes eggs scrambled with spices, potatoes, and onions, as well as fresh fruit and yogurt. Breakfast in China often consists of rice complemented by vegetables, meat, or fish. In Korea, a traditional breakfast would include soup made of either beef ribs or pork intestines, a selection of bread and pastries, rice, and kimchi, which is believed to promote intestinal health. Breakfast in Japan does not greatly differ from any other meal. It typically consists of a bowl of steamed white rice, a small piece of fish, a bowl of miso soup with tofu, vegetables, green tea, and occasionally pickled plums called umeboshi. Hot bowls of noodles in broth topped with pork slices, scallions, and bamboo shoots are also common.



Figure 3.8.2: In the different regions of China, congee is prepared with various types of rice, which results in different consistencies. In Japan, Nanakusa-gayu (七草粥), seven-herb porridge. (CC BY-SA 3.0; Blue Lotus).

Congee is a common breakfast food across Asia. This dish is a porridge made of rice that is consumed in a number of Asian countries, including Vietnam, Thailand, Burma, and Bangladesh. Congee can be prepared both savory and sweet and contain a variety of ingredients, usually meats, vegetables, and herbs. It can be eaten alone or served as a side dish.

The Diversity of Palates and Habits

Around the globe, people enjoy different foods and different flavors. In some cultures, the main dishes are meat-based, while others focus on plant-based meals. You can also find different staples in different regions of the world, including rice, potatoes, pasta, corn, beans, root vegetables, and many kinds of grains. Different flavors are also popular on different parts of the planet, from sweet to salty to sour to spicy.

Food Availability

People tend to eat what grows or lives nearby. For example, people in coastal areas tend to consume more seafood, while those in inland areas tend to structure their diet around locally-grown crops, such as potatoes or wheat. In many developing countries, a large part of the diet is composed of cereal grains, starchy roots, and legumes. However, a number of common staples are consumed worldwide, including rice, corn, wheat, potatoes, cassava, and beans.

Income and Consumption

In addition to regional dissimilarities in diets, income also plays a major role in what foods people eat and how they prepare them. The average global calorie consumption has increased to record levels in recent years. This is a consequence of rising incomes, which have allowed consumers in many regions to expand both the variety and the quantity of food they eat. Among developing countries, the daily intake of calories per person rose by nearly 25 percent from the early 1970s to the mid-1990s.US Department of Agriculture, Foreign Agricultural Service. "Diets Around the World: How the Menu Varies." Last modified October 14, 2004. www.fas.usda.gov/info/agexpor.../Apr/diets.htm.' Centers for Disease Control and Prevention. "Caloric Consumption on the Rise in the United States, Particularly Among Women." NCHS Press Room, February 5, 2004. http://www.cdc.gov/nchs/pressroom/04news/calorie.htm. People in the western world were able to increase their consumption of meat and poultry, fruits and vegetables, and fats and oils. However, those gains were minimal in the poorest countries, where many

continue to struggle with hunger and a limited diet.US Department of Agriculture, Foreign Agricultural Service. “Diets Around the World: How the Menu Varies.” Last modified October 14, 2004. www.fas.usda.gov/info/agexpor.../Apr/diets.htm.

Different Ways of Eating

People from different parts of the world consume their food in different ways and what is common in one country may be considered impolite in another. For example, in some areas people eat with their fingers, while in others using a fork is much more acceptable. In some regions of the world, people slurp their soup, while in others they quietly sip it. In some places, diners eat off of individual plates, while in others people sit at a table with a large communal plate from which everyone eats.

No matter where you travel, you will find that food production, purchase, and preparation affect all facets of life, from health and economics to religion and culture. Therefore, it is vital for people from all walks of life to consider the choices they make regarding food, and how those decisions affect not only their bodies, but also their world. Alice Waters, an influential chef and founder of the nonprofit program Edible Schoolyard, as well as an advocate for sustainable production and consumption, has said, “Remember food is precious. Good food can only come from good ingredients. Its proper price includes the cost of preserving the environment and paying fairly for the labor of the people who produce it. Food should never be taken for granted.”Waters, A. “The Art of Eating.” PlanetGreen.com. March 31, 2009. http://planetgreen.discovery.com/fea...eat-green.html.

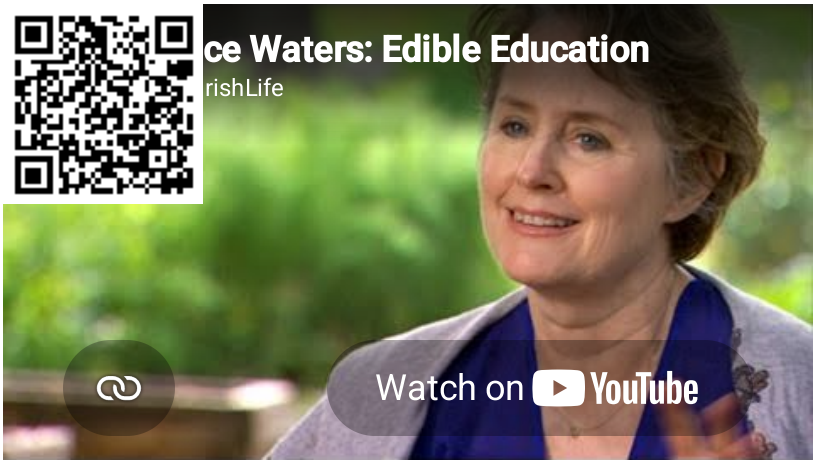


Figure 3.8.2*: Alice Waters: Edible Education. In this video, Edible Schoolyard founder Alice Waters talks about the value of growing a garden and learning about food.*

Key Takeaways

Many people around the world have access to a wide variety of food and can prepare it any way they choose. However, cuisine remains strongly influenced by location, culture, tradition, and economics. People from all cultures and all walks of life should consider the choices they make regarding food, and how those decisions affect not only their bodies, but also the world.

Discussion Starter

1. Compare and contrast breakfast in different parts of the world. What are common attitudes about the first meal of the day? How are the choices that people make the same? How are they different? Are there any breakfast dishes in common?

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3.E: Food Politics and Perspectives (Exercise)

It's Your Turn

1. Visit a store and study the labels for one kind of processed food. List all of the additives it contains and research them at the library or on the Internet. Why was each substance included during the processing stage?
2. Create a brochure for tourists to explain the kinds of foods they can expect to encounter in one region of the world. Reference a few popular dishes and a few considerations they might need to keep in mind during their travels.
3. How can you move toward a more sustainable diet? Make a list of the kinds of changes you could make to the foods you choose and the ways you prepare them.

Apply It

1. Create a short newsletter for parents explaining the value of home-cooked, family meals. Describe how sitting down together for a few meals each week can benefit different members of the family. You may also wish to include one or two tips that parents can use to encourage their children to make mealtimes a priority.
2. Plan a website that addresses the rising price of food around the world. Describe the look and focus of the main page, along with subsections that you will include. Also provide links to related material already available online.
3. Research one of the different cuisines described in this chapter, such as the Indian or Ethiopian diet. Explore the history of the diet, along with the climate, soil, and other factors that affect the foods that farmers grow and how consumers prepare them. Then create a report to explain your findings.

Expand Your Knowledge

1. Write a short script for a public service announcement that explains the benefits and risks of food additives. What do you believe the public should know about the natural and synthetic substances that are introduced to foods during the processing stage?
2. Summarize in a written discussion why economic experts believe the era of cheap food is over. What factors have contributed to rising food prices around the globe?
3. Draw a comic strip that shows the different facets of a food system for a particular crop, from production to consumption.

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CHAPTER OVERVIEW

4: Nutritional Issues

Learning Objectives

By the end of this chapter, you will be able to:

- Describe the different types of diets
- Describe the relationship between nutrition and health
- Describe overnutrition, undernutrition, and malnutrition
- Describe different careers in nutrition

Good nutrition equates to receiving enough (but not too much) of the macronutrients (proteins, carbohydrates, fats, and water) and micronutrients (vitamins and minerals) so that the body can stay healthy, grow properly, and work effectively. The phrase “you are what you eat” means that your body will respond to the food it receives, either good or bad. Processed, sugary, high-fat, and excessively salted foods leave the body unable to perform effectively. By contrast, eating a variety of foods from all food groups fuels the body by providing what it needs to produce energy, promote metabolic activity, prevent micronutrient deficiencies, ward off chronic disease, and bolster a sense of overall health and well-being.

4.1: Introduction to Nutritional Issues
4.2: Comparing Diets
4.3: Calories In Versus Calories Out
4.4: Nutrition, Health and Disease
4.5: Threats to Health
4.6: Undernutrition, Overnutrition, and Malnutrition
4.7: Food Insecurity
4.8: Careers in Nutrition

Thumbnail: “Earth in Hand” Image from flickr.com

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4.1: Introduction to Nutritional Issues

> *Mai ka piko o ke poʻo a ka poli o ka wāwae, a laʻa ma na kihi ʻhā o ke kino*
>
> *From the crown of the head to the soles of the feet, and the four corners of the body*



Figure 4.1.1: “Earth in Hand” Image from flickr.com

There are a multitude of diets across the globe, in all regions and cultures. Each is influenced by the traditions of the past, along with the produce and livestock available. Traditional diets around the globe, such as for Native Hawaiians, were comprised of foods low in fats like fresh fish, and high in complex carbohydrates such as kalo (taro) and ʻulu (breadfruit). However, with modernization and the influence from other ethnic groups that have migrated to the Hawaiian Island chain, the diet has transitioned to be high in animal fat, processed meats, and simple carbohydrates. These changes have played a role in the shift in health issues that many Native Hawaiians are facing today. To learn more about the nutrition transition in the Pacific, visit manoa.hawaii.edu/ctahr/pacificfoodguide/index.php/regional-information/.

Good nutrition equates to receiving enough (but not too much) of the macronutrients (proteins, carbohydrates, fats, and water) and micronutrients (vitamins and minerals) so that the body can stay healthy, grow properly, and work effectively. The phrase “you are what you eat” means that your body will respond to the food it receives, either good or bad. Processed, sugary, high-fat, and excessively salted foods leave the body unable to perform effectively. By contrast, eating a variety of foods from all food groups fuels the body by providing what it needs to produce energy, promote metabolic activity, prevent micronutrient deficiencies, ward off chronic disease, and bolstering a sense of overall health and well-being.

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4.2: Comparing Diets

Diet Trends and Health

In the past, health was regarded merely as the absence of illness. However, a growing understanding of the complexity and potential of the human condition has prompted a new way of thinking about health. Today, we focus on the idea of wellness, which involves a great deal more than just not being sick. Wellness is a state of optimal well-being that enables an individual to maximize their potential. This concept includes a host of dimensions—physical, mental, emotional, social, environmental, and spiritual—which affect one's quality of life.[1] Striving for wellness begins with an examination of dietary choices.

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.

Everyday Connections

In the past, people's culture and location determined the foods they ate and the manner in which they prepared their meals. For example, in Hawai‘i, taro was a staple complex carbohydrate that could be eaten in various ways such as poi and pa‘ia‘i. Today, most people have access to a wide variety of food and can prepare them any way they choose. However, customs and traditions still strongly influence diet and cuisine in most areas of the world. To learn more about the food and culture in the pacific, visit manoa.hawaii.edu/ctahr/pacificfoodguide/index.php/regional-information/

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 American Dietetic Association, 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.[2]

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 moderate amounts of dark chocolate, made with 70% or more cacao (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.

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 for certain populations. 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.[3]

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 are recommended to consume a variety 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 limits 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.[4]

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. Other low-carb diets include the Paleolithic (Paleo) and Ketogenic (Keto) Diet. The Paleo diet mimics foods that humans consumed during the Stone Age or the Paleolithic period. This diet promotes higher amounts of grass-fed only animal protein, healthy fats, and non-starchy vegetables (i.e. okra, bok choy, carrots).[5] Similarly, the Keto diet highlights high protein intake and healthy fats however there is more flexibility with the source of animal protein and it does not have to be limited to grass-fed.[6] Furthermore, the Paleo diet does not allow for dairy foods while the Keto diet allows dairy foods without added sugar.

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 carbohydrates 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.[7]

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.[8]

The Macrobiotic Diet

The macrobiotic diet is part of a health and wellness regimen based in Eastern philosophy. It combines certain tenets of Zen Buddhism with a vegetarian diet and supports a balance of the oppositional forces of yin and yang. Foods are paired based on their so-called yin or yang characteristics. Yin foods are thought to be sweet, cold, and passive, while yang foods are considered to be salty, hot, and aggressive.

Whole grains make up about 50 percent of the calories consumed and are believed to have the best balance of yin and yang. Raw and cooked vegetables comprise about 30 percent of the diet and include kale, cabbage, collards, bok choy, and broccoli on a daily basis, along with mushrooms and celery a few times a week. Bean or vegetable-based soups and broths can make up 5 to 10 percent of daily caloric intake. Additionally, the diet allows small amounts of fish and seafood several times a week, along with a few servings of nuts. The macrobiotic diet prohibits certain foods, such as chocolate, tropical fruits, and animal products, because they are believed to fall on the far end of the yin-yang spectrum, which would make it difficult to achieve a Zen-like balance.

The macrobiotic diet focuses on foods that are low in saturated fats and high in fiber, which can help to lower the risk of cardiovascular disease. Proponents of this diet also believe that it may protect against cancer. However, many nutritionists and healthcare providers express concerns, particularly if the diet is followed strictly. Extreme macrobiotic eating can be low in protein, low in calories, and pose a risk for starvation. In addition, the diet is also very low in essential vitamins and minerals.[9]

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 limits 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. 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.[10]

Tools for Change

For six years, researchers from the University of Bordeaux in France followed the dietary habits of more than seven thousand individuals age sixty-five and over. Participants who described greater consumption of extra-virgin olive oil reportedly lowered their risk of suffering a stroke by 41 percent. The study controlled for stroke risk factors, such as smoking, alcohol intake, high blood pressure, and a sedentary lifestyle. To increase the amount of olive oil in your diet, try spreading olive oil instead of butter on your toast, making your own salad dressing using olive oil, vinegar or lemon juice, and herbs, cooking with olive oil exclusively, or simply adding a dose of it to your favorite meal.[11]

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 unprocessed 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.[12]

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.” A meat-based food system requires more energy, land, and water resources than a plant-based food system. This may suggest that the plant-based diet is more sustainable than the average meat-based diet in the U.S.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 lacto vegetarians, 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 B_{12}. Also, if people who follow these diets do not plan out their meals, they may gravitate toward foods high in fats.

Table 4.2.1: The Pros and Cons of Seven Popular Diets

Diet	Pros	Cons
DASH Diet	• 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	• There are very few negative factors associated with the DASH diet • Risk for hyponatremia
Gluten-Free Diet	• Reduces the symptoms of gluten intolerance, such as chronic diarrhea, cramping, constipation, and bloating • Promotes healing of the small intestines for people with celiac disease, preventing malnutrition • May be beneficial for other autoimmune diseases, such as Parkinson’s disease, rheumatoid arthritis, and multiple sclerosis	• Risk of folate, iron, thiamin, riboflavin, niacin, and vitamin B6 deficiencies • Special gluten-free products can be hard to find and expensive • Requires constant vigilance and careful food label reading, since gluten is found in many products

Diet	Pros	Cons
Low-Carb Diet	• Restricts refined carbohydrates, such as white flour and white sugar • May temporarily improve blood sugar or blood cholesterol levels	• Not entirely evidence-based • Results in higher fat and protein consumption • Does not meet the RDA for carbohydrates to provide glucose to the brain
Macrobiotic Diet	• Low in saturated fats and high in fiber • Emphasizes whole foods and de-emphasizes processed foods • Rich in phytoestrogens, which may reduce the risk of estrogen-related cancers	• Not entirely evidence-based • Lacks certain vitamins and minerals; supplements are often required • Can result in a very low caloric intake • Lack of energy may result from inadequate protein
Mediterranean Diet	• 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	• 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	• Emphasizes whole foods • Focuses on nutritionally-rich foods	• Not entirely evidence-based • Very restrictive and limits protein and healthy fat intake • Could encourage the development of foodborne illness • Extremely difficult to follow • High in fiber which can cause essential nutrient deficiencies
Vegetarianism and Veganism	• May reduce some chronic diseases such as cancer, heart disease, and Type 2 diabetes • May help with weight reduction and weight maintenance	• Guidelines regarding fat and nutrient consumption must be followed • Higher risk for nutrient deficiencies such as protein, iron, zinc, omega-3, vitamin B12 • Consumption of a high fiber diet interferes with mineral and nutrient bioavailability • Vegetarian and vegan protein sources are lower quality with majority missing at least one essential amino acids

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4.3: Calories In Versus Calories Out

The ability to estimate energy expenditure and quantify calories consumed, has led to the simple conclusion that tracking or counting “calories in” compared to “calories out” will result in an easy way to manage body weight. This logic does not take into account the complexity and individuality of the human body. Human bodies are not static, meaning there are fluctuations from day to day in energy needs related to set point, sleep patterns, stress levels, activity levels, and eating patterns. Something as simple as the timing and macronutrient composition of meals, will impact the thermic effect of food, resulting in a change in energy expenditure.



Figure 4.3.1: Image by mojzagrebinfo / Pixabay License

Dieting Basics/ Dieting 101

The diet and weight loss industry is big business. In 2017, The U.S. Weight Loss and Diet Control Market reported a record $72 billion dollar value to the weight loss market.[1] This dollar amount is expected to continue to rise. At the same time, there is evidence that diets do not lead to long term weight loss for the majority of people. In observational studies, dieting was the best predictor of future weight gain and onset of obesity.[2][3][4] Meta-analysis and reviews of randomized clinical trials reported that on average, obesity treatments cause weight gain.[5][6] This additional weight gain leads to an increase in the set point, making it more difficult for an individual to lose weight in the future. Others reported a 3-5 % weight loss was possible 4 years later if participants continued all aspects of treatment.[7] For a 200 pound person, this represents a 6-10 pound weight loss. The health benefits of this modest weight loss are unclear and it is far less what is expected or desired when following a diet. In conclusion, the diet industry makes money from a product that is proven not to work.

Dieting and Health

The scientific evidence shows that diets lead to modest weight loss for some and future weight gain for the majority of people. This often leads to a behavior called weight cycling or yo-yo dieting. The person continues to seek weight loss and a new diet, hoping to get a new result. This repetition of starting and stopping diets leads to losing and gaining a similar amount of weight over and over again. The weight goes up and down like a yo-yo. In addition, when someone cuts out food groups and restricts certain foods from their diet, the interest in the food increases. This in combination with intense hunger resulting from energy restriction, leads to a feeling of being out of control around foods and binge eating. To compensate for the feeling out of control, the person then restricts the food again and is then in a restriction/ binge or overeating cycle.

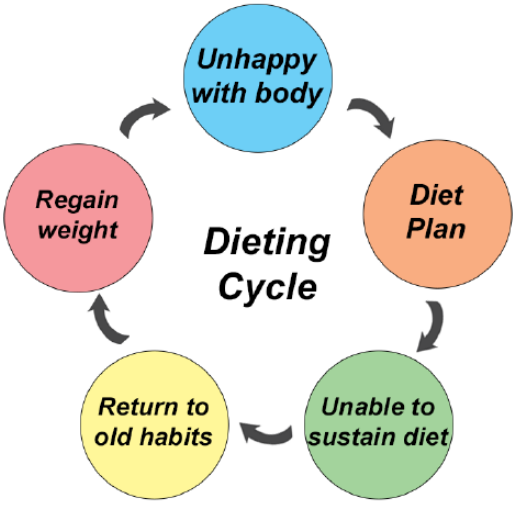


Figure 4.3.2: Image by Kellie Taguchi / CC BY 4.0

The majority (up to 95%) of people regain the weight within three years and often gain back more.[8][9] Weight cycling puts stress on the body causing physical complications that are harmful, resulting in lowered or slowed metabolism, a reduction in lean body mass or muscle tissue, lowered body temperature, and increased risk for eating disorders.[10][11] Dieting and weight cycling also have a negative impact on mental health including lower self-esteem, and increases in depression, anxiety, irritability, and nervousness.[12] The evidence shows that dieting reduces both physical and emotional health.

Health and Body Weight

The assumption that health is determined by body weight, or a number on the scale, is outdated and not supported by science. As obesity rates continue to rise, it has been speculated that a higher BMI stands alone as a health risk. However, there is substantial scientific evidence to support the notion that obesity in itself does not put an individual at increased risk of disease. The majority of epidemiological studies demonstrate that five pounds “underweight” is more harmful than 75 pounds “overweight”. [13][14][15][16][17] The results of multiple studies have indicated that using weight as a criterion for health is off-target and potentially harmful.[18][19][20] This suggests that it is not possible to tell how healthy an individual is simply by looking at them or calculating their BMI.



Figure 4.3.3: Image by 272447 / Pixabay License

The following are measurable risk factors and markers of health that are not connected to body weight. These are good targets for nutrition education and counseling and ways to monitor improvements of health status over time.

- Biomarkers: blood pressure, blood glucose, total cholesterol, high-density lipoproteins, low-density lipoproteins, triglycerides
- Regular movement/ activity/ exercise
- Stress and inflammation
- Hormone balance
- Mental health status
- Sleep
- Quality of life
- Connection to the community
- Spiritual health
- Intellectual health
- Occupational health

Health at Every Size

At its foundation, Health at Every Size (HAES) supports behavior changes that create sustainable habits to improve health and promote a better quality of life.[21] The HAES approach is an alternative to the weight/size-based approach with a focus on improving health without a focus on weight loss. The research shows this model is able to promote sustainable improvements in health.

"In a study comparing the HAES model to a diet approach, though only dieters lost weight, both groups initially had similar improvements in metabolic fitness, activity levels, psychological measures, and eating behaviors. After two years, dieters had regained their weight and lost the health improvements, while the HAES group sustained their health improvements".[22]

The Health At Every Size® Principles are:

1. **Weight Inclusivity**: Accepting and respecting the diversity of body shapes and sizes
2. **Health Enhancement**: Recognizing that health and well-being are multi-dimensional and that they include physical, social, spiritual, occupational, emotional, and intellectual aspects
3. **Respectful Care**: Promoting all aspects of health and well-being for people of all sizes
4. **Eating for Well-being**: Promoting eating in a manner which balances individualized nutritional needs, hunger, satiety, appetite, and pleasure
5. **Life-Enhancing Movement**: Promoting individually appropriate, enjoyable, life-enhancing physical activity, rather than exercise that is focused on a goal of weight loss

In the Hawaiian language, Lokahi means "unity, agreement, accord, and harmony".[23] The concept of Lokahi can be used to describe the balance between the relationship an individual has with the body, the mind, the spirit, and the rest of the world.

The image below illustrates the overlap of the Hawaiian principle of Lokahi with the Health at Every Size principle #2: Health enhancement.



Figure 4.3.4: Image by Jennifer Draper / CC BY 4.0

Intuitive Eating

Intuitive eating is a non-diet approach to eating that promotes a connection to body cues of hunger and fullness and the selection of foods based on both pleasure and nutrient density.[24] When an individual is able to disconnect from diet culture and a focus on weight loss, they are able to eat in ways that support having energy throughout the day and feel competent around all foods. Instead of an outward focus on counting calories, dietary restriction, and measuring food portions, intuitive eating teaches a mindfulness practice of going inward and learning to respond to the cues and rhythms of the body. A review of 22 intervention studies that compared traditional weight loss to the intuitive eating approach concluded that the participants in the non-diet groups were able to stop unhealthy weight controlling behaviors, improve metabolic fitness and reduce risk factors, increase body satisfaction, and improve psychological distress.[25] While the non-diet approach has not been shown to promote weight loss, a review of clinical trials concluded that intuitive eating was able to stabilize weight and help to prevent future weight gain, in addition to an improvement in blood pressure and cholesterol levels, and dietary intake.[26]



Figure 4.3.5: Image by CDC / Unsplash License

The 10 Principles of Intuitive Eating

1. Reject the diet mentality
2. Honor your hunger
3. Make peace with food
4. Challenge the food police
5. Discover the satisfaction factor

6. Feel your fullness
7. Cope with your emotions with kindness
8. Respect your body
9. Movement- Feel the difference
10. Honor your health – gentle nutrition

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4.4: Nutrition, Health and Disease

Disorders That Can Compromise Health

When nutrients and energy are in short supply, cells, tissues, organs, and organ systems do not function properly. Unbalanced diets can cause diseases and, conversely, certain illnesses and diseases can cause an inadequate intake and absorption of nutrients, simulating the health consequences of an unbalanced diet. Overeating high-fat foods and nutrient-poor foods can lead to obesity and exacerbate the symptoms of gastroesophageal reflux disease (GERD) and irritable bowel syndrome (IBS). Many diseases and illnesses, such as celiac disease, interfere with the body getting its nutritional requirements. A host of other conditions and illnesses, such as food allergies, cancer, stomach ulcers, Crohn's disease, and kidney and liver disease, also can impair the process of digestion and/or negatively affect nutrient balance and decrease overall health. Some illnesses that can compromise health are chronic and persist for a long time, some are communicable and can be transmitted between people, and some are non-communicable and are not infectious.

Gastroesophageal Reflux Disease

Gastroesophageal reflux disease (GERD) is a persistent form of acid reflux that occurs more than two times per week. Acid reflux occurs when the acidic contents of the stomach leak backward into the esophagus and cause irritation. It is estimated that GERD affects 25 to 35 percent of the US population. An analysis of several studies published in the August 2005 issue of Annals of Internal Medicine concludes that GERD is much more prevalent in people who are obese.[1] The most common GERD symptom is heartburn, but people with GERD may also experience regurgitation (flow of the stomach's acidic contents into the mouth), frequent coughing, and trouble swallowing.

There are other causative factors of GERD that may be separate from or intertwined with obesity. The sphincter that separates the stomach's internal contents from the esophagus often does not function properly and acidic gastric contents seep upward. Sometimes the peristaltic contractions of the esophagus are also sluggish and compromise the clearance of acidic contents. In addition to having an unbalanced, high-fat diet, some people with GERD are sensitive to particular foods—chocolate, garlic, spicy foods, fried foods, and tomato-based foods—which worsen symptoms. Drinks containing alcohol or caffeine may also worsen GERD symptoms. GERD is diagnosed most often by a history of the frequency of recurring symptoms. A more proper diagnosis can be made when a doctor inserts a small device into the lower esophagus that measures the acidity of the contents during one's daily activities. About 50 percent of people with GERD have inflamed tissues in the esophagus.

The first approach to GERD treatment is dietary and lifestyle modifications. Suggestions are to reduce weight if you are overweight or obese, avoid foods that worsen GERD symptoms, eat smaller meals, stop smoking, and remain upright for at least three hours after a meal. People with GERD may not take in the nutrients they need because of the pain and discomfort associated with eating. As a result, GERD can be caused by an unbalanced diet and its symptoms can lead to a worsening of nutrient inadequacy, a vicious cycle that further compromises health. Some evidence from scientific studies indicates that medications used to treat GERD may accentuate certain nutrient deficiencies, namely zinc and magnesium. When these treatment approaches do not work surgery is an option. The most common surgery involves reinforcing the sphincter that serves as a barrier between the stomach and esophagus.

Irritable Bowel Syndrome

Irritable bowel syndrome (IBS) is characterized by muscle spasms in the colon that result in abdominal pain, bloating, constipation, and/or diarrhea. Interestingly, IBS produces no permanent structural damage to the large intestine as often happens to patients who have Crohn's disease or inflammatory bowel disease. It is estimated that one in five Americans displays symptoms of IBS. The disorder is more prevalent in women than men. Two primary factors that contribute to IBS are an unbalanced diet and stress.

Symptoms of IBS significantly decrease a person's quality of life as they are present for at least twelve consecutive or nonconsecutive weeks in a year. Large meals and foods high in fat and added sugars, or those that contain wheat, rye, barley, peppermint, and chocolate intensify or bring about symptoms of IBS. Additionally, beverages containing caffeine or alcohol may worsen IBS. Stress and depression compound the severity and frequency of IBS symptoms. As with GERD, the first treatment approaches for IBS are diet and lifestyle modifications. People with IBS are often told to keep a daily food journal to help identify and eliminate foods that cause the most problems. Other recommendations are to eat slower, add more fiber to the diet, drink more water, and to exercise. There are some medications (many of which can be purchased over-the-counter) to treat IBS and the resulting diarrhea or constipation. Sometimes antidepressants and drugs to relax the colon are prescribed.

Celiac Disease

Celiac disease is an autoimmune disorder affecting between 0.5 and 1.0 percent of Americans—that is, one in every one- to two-hundred people. It is caused by an abnormal immune reaction of small intestine cells to a type of protein, called gluten. Gluten forms in the presence of water and is composed of two protein parts, glutenin and gliadin. Glutenin and gliadin are found in grains that are commonly used to make bread, such as wheat, rye, and barley. When bread is made, yeast eats the flour and makes a waste product, carbon dioxide, which forms bubbles in the dough. As the dough is kneaded, gluten forms and stretches. The carbon dioxide gas bubbles infiltrate the stretchy gluten, giving bread its porosity and tenderness. For those who are sensitive to gluten, it is good to know that corn, millet, buckwheat, and oats do not contain the proteins that make gluten. However, some people who have celiac disease also may have a response to products containing oats. This is most likely the result of cross-contamination of grains during harvest, storage, packaging, and processing.

Celiac disease is most common in people of European descent and is rare in people of African American, Japanese, and Chinese descent. It is much more prevalent in women and in people with Type 1 diabetes, autoimmune thyroid disease, and Down and Turner syndromes. Symptoms can range from mild to severe and can include pale, fatty, loose stools, gastrointestinal upset, abdominal pain, weight loss and, in children, a failure to grow and thrive. The symptoms can appear in infancy or much later in life, even by age seventy. Celiac disease is not always diagnosed because the symptoms may be mild. A large number of people have what is referred to as “silent” or “latent” celiac disease.

Celiac disease diagnosis requires a blood test and a biopsy of the small intestine. Because celiac disease is an autoimmune disease, antibodies produced by white blood cells circulate in the body and can be detected in the blood. When gluten-containing foods are consumed the antibodies attack cells lining the small intestine leading to a destruction of the small villi projections. This tissue damage can be detected with a biopsy, a procedure that removes a portion of tissue from the damaged organ. Villi destruction is what causes many of the symptoms of celiac disease. The destruction of the absorptive surface of the small intestine also results in the malabsorption of nutrients, so that while people with this disease may eat enough, nutrients do not make it to the bloodstream because absorption is reduced. The effects of nutrient malabsorption are most apparent in children and the elderly as they are especially susceptible to nutrient deficiencies. Over time these nutrient deficiencies can cause health problems. Poor absorption of iron and folic acid can cause anemia, which is a decrease in red blood cells. Anemia impairs oxygen transport to all cells in the body. Calcium and vitamin D deficiencies can lead to osteoporosis, a disease in which bones become brittle.

If you think you or someone close to you may have celiac disease, do not despair; it is a very treatable disease. Once diagnosed, a person follows a gluten-free diet for life. This requires dedication and careful detective work to seek out foods with hidden gluten, but some stores carry gluten-free foods. After eliminating gluten from the diet, the tissues of the small intestine rapidly repair themselves and heal in less than six months.

Food Allergies

Paying attention to the way individuals react to various foods is essential in determining what foods may specifically affect a person adversely. Food allergies are one of the many ways in which different body make-ups affect nutritional concerns. Although an estimated twelve million Americans have food allergies, there are likely many more people who say they have food allergies than actually do. This is because food sensitization is different from a medically-determined food allergy. When someone has a food allergy, the immune system mistakenly attacks a certain kind of food (usually the protein component of a food), such as peanuts, as if it were a threat and IgE antibodies are produced. Doctors sometimes test for food allergies by using skin-prick tests or blood tests to look for the presence of IgE antibodies. However, these types of tests are not always reliable as they can sometimes yield a false positive result. By far, the most valuable tests for determining a food allergy is the Double Blind Placebo Controlled Food Challenge (DBPCFC), which involves administering the food orally and then denoting the signs and symptoms of the allergic response.

Food allergy symptoms usually develop within a few minutes to two hours after a person has eaten a food to which they are allergic. These symptoms can range from the annoying to the potentially fatal, and include:

- A tingling mouth
- Swelling tongue and/or throat
- Difficulty breathing
- Hives
- Stomach cramps
- Diarrhea

- Vomiting
- Drop in blood pressure
- Loss of consciousness
- Death

There are no clear treatments for food allergies. Epinephrine is sometimes used to control severe reactions, and individuals with known and dangerous allergies may get prescriptions for self-injectable devices. The only certain way to avoid allergic reactions to food is to avoid the foods that cause them. Beyond avoidance, this can mean reading food labels carefully, or even calling manufacturers for product information.

Ninety percent of food allergies are caused by these eight foods:

1. Milk
2. Eggs
3. Peanuts
4. Tree nuts
5. Fish
6. Shellfish
7. Wheat
8. Soy

The prevalence of food allergies is a complex and growing problem. In response to this situation, the National Institute of Allergy and Infectious Diseases (NIAID) collaborated with thirty-four professional organizations, federal agencies, and patient-advocacy groups to develop a comprehensive guide to diagnosing and managing food allergies and treating acute food allergy reactions. The guide defines various food allergies, allergens, and reactions, provides comprehensive information on the prevalence of different food allergies, tracks the history of food allergies, and reviews medical management techniques for people with food allergies.

Oral Disease

Oral health refers not only to healthy teeth and gums, but also to the health of all the supporting tissues in the mouth such as ligaments, nerves, jawbone, chewing muscles, and salivary glands. Over ten years ago the Surgeon General produced its first report dedicated to oral health, stating that oral health and health in general are not separate entities.[2]

Instead, oral health is an integral part of overall health and well-being. Soft drinks, sports drinks, candies, desserts, and fruit juices are the main sources of “fermentable sugars” in the American diet. (Fermentable sugars are those that are easily metabolized by bacteria in a process known as fermentation. Glucose, fructose, and maltose are three examples.) Bacteria that inhabit the mouth metabolize fermentable sugars and starches in refined grains to acids that erode tooth enamel and deeper bone tissues. The acid creates holes (cavities) in the teeth that can be extremely painful. Gums are also damaged by bacteria produced by acids, leading to gingivitis (characterized by inflamed and bleeding gums). Saliva is actually a natural mouthwash that neutralizes the acids and aids in building up teeth that have been damaged.



Figure 4.4.1: Gingivitis. “Gingivitis” / CC0 1.0

According to Healthy People 2010, 23 percent of US children have cavities by the age of four, and by second grade, one-half of all children in this country have at least one cavity.[3]

Cavities are an epidemic health problem in the United States and are associated with poor diet, but other contributors include poor dental hygiene and the inaccessibility to regular oral health care. A review in Academic Pediatrics reports that “frequent consumption of fast-releasing carbohydrates, primarily in the form of dietary sugars, is significantly associated with increased

dental caries risk."[4] In regards to sugary soft drinks, the American Dental Association says that drinking sugary soft drinks increases the risk of decay formation.[5]

Colon Health

A substantial health benefit of whole grain foods is that fiber actively supports digestion and optimizes colon health. (This can be more specifically attributed to the insoluble fiber content of whole grains.) There is good evidence supporting that insoluble fiber prevents the irritating problem of constipation and the development of diverticulosis and diverticulitis. Diverticulosis is a benign condition characterized by outpouches of the colon. Diverticulitis occurs when the outpouches in the lining of the colon become inflamed. Interestingly, diverticulitis did not make its medical debut until the early 1900s, and in 1971 was defined as a deficiency of whole-grain fiber. According to the National Digestive Diseases Information Clearinghouse, 10 percent of Americans over the age of forty have diverticulosis, and 50 percent of people over the age of sixty have the disorder.[6] Ten to 25 percent of people who have diverticulosis go on to develop diverticulitis.[7] Symptoms include lower abdominal pain, nausea, and alternating between constipation and diarrhea.

The chances of developing diverticulosis can be reduced with fiber intake because of what the breakdown products of the fiber do for the colon. The bacterial breakdown of fiber in the large intestine releases short-chain fatty acids. These molecules have been found to nourish colonic cells, inhibit colonic inflammation, and stimulate the immune system (thereby providing protection of the colon from harmful substances). Additionally, the bacterial indigestible fiber, mostly insoluble, increases stool bulk and softness increasing transit time in the large intestine and facilitating feces elimination. One phenomenon of consuming foods high in fiber is increased gas, since the byproducts of bacterial digestion of fiber are gases.

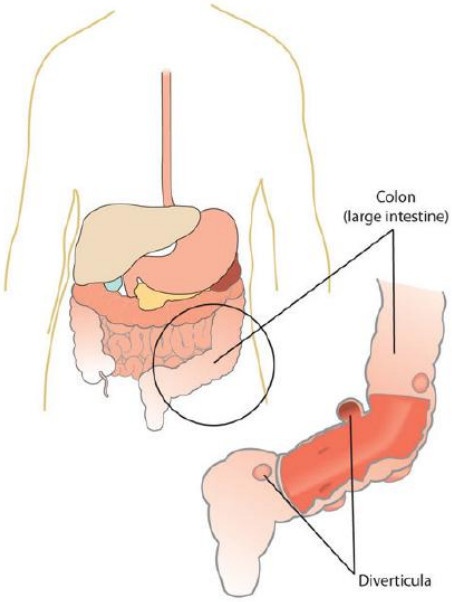


Figure 4.4.2: Diverticulitis: A Disease of Fiber Deficiency. Image by Allison Calabrese / CC BY 4.0

Some studies have found a link between high dietary-fiber intake and a decreased risk for colon cancer. However an analysis of several studies, published in the Journal of the American Medical Association 2005, did not find that dietary-fiber intake was associated with a reduction in colon cancer risk.[8] There is some evidence that specific fiber types (such as inulin) may protect against colon cancer, but more studies are needed to conclusively determine how certain fiber types (and at what dose) inhibit colon cancer development.

Osteoporosis

There are several factors that lead to loss of bone quality during aging, including a reduction in hormone levels, decreased calcium absorption, and increased muscle deterioration. It is comparable to being charged with the task of maintaining and repairing the structure of your home without having all of the necessary materials to do so. However, you will learn that there are many ways to maximize your bone health at any age.

Osteoporosis is the excessive loss of bone over time. It leads to decreased bone strength and an increased susceptibility to bone fracture. The Office of the Surgeon General (OSG) reports that approximately ten million Americans over age fifty are living with

osteoporosis, and an additional thirty-four million have osteopenia, which is lower-than-normal bone mineral density.[9]

Osteoporosis is a debilitating disease that markedly increases the risks of suffering from bone fractures. A fracture in the hip causes the most serious consequences—and approximately 20 percent of senior citizens who have one will die in the year after the injury. Osteoporosis affects more women than men, but men are also at risk for developing osteoporosis, especially after the age of seventy. These statistics may appear grim, but many organizations—including the National Osteoporosis Foundation and the OSG—are disseminating information to the public and to health-care professionals on ways to prevent the disease, while at the same time, science is advancing in the prevention and treatment of this disease.[10]

As previously discussed, bones grow and mineralize predominantly during infancy, childhood, and puberty. During this time, bone growth exceeds bone loss. By age twenty, bone growth is fairly complete and only a small amount (about 10 percent) of bone mass accumulates in the third decade of life. By age thirty, bone mass is at its greatest in both men and women and then gradually declines after age forty. Bone mass refers to the total weight of bone tissue in the human body. The greatest quantity of bone tissue a person develops during his or her lifetime is called peak bone mass. The decline in bone mass after age forty occurs because bone loss is greater than bone growth. The increased bone degradation decreases the mineral content of bone tissue leading to a decrease in bone strength and increased fracture risk.

Osteoporosis is referred to as a silent disease, much like high blood pressure, because symptoms are rarely exhibited. A person with osteoporosis may not know he has the disease until he experiences a bone break or fracture. Detection and treatment of osteoporosis, before the occurrence of a fracture, can significantly improve the quality of life. To detect osteopenia or osteoporosis, BMD must be measured by the DEXA procedure.

During the course of osteoporosis, BMD decreases and the bone tissue microarchitecture is compromised. Excessive bone resorption in the trabecular tissue increases the size of the holes in the lattice-like structure making it more porous and weaker. A disproportionate amount of resorption of the strong cortical bone causes it to become thinner. The deterioration of one or both types of bone tissue causes bones to weaken and, consequently, become more susceptible to fractures. The American Academy of Orthopaedic Surgeons reports that one in two women and one in five men older than sixty-five will experience a bone fracture caused by osteoporosis.[11]

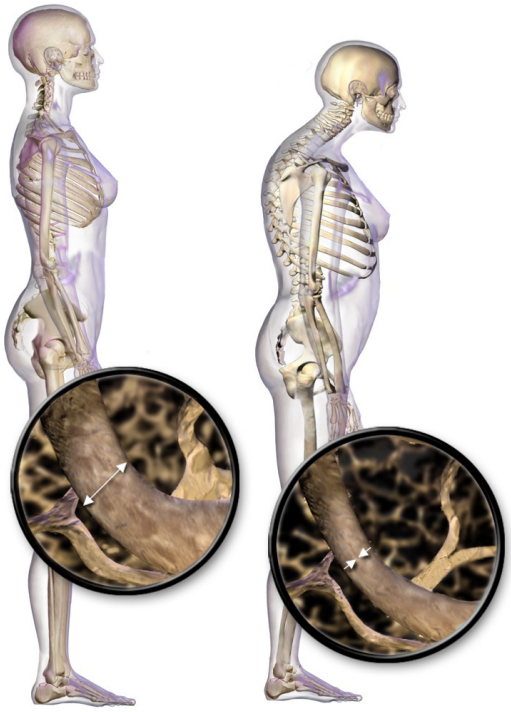


Figure 18.3 Osteoporosis in Vertebrae. Image by BruceBlaus/ CC BY 4.0

When the vertebral bone tissue is weakened, it can cause the spine to curve. The increase in spine curvature not only causes pain, but also decreases a person's height. Curvature of the upper spine produces what is called Dowager's hump, also known as kyphosis. Severe upper-spine deformity can compress the chest cavity and cause difficulty breathing. It may also cause abdominal pain and loss of appetite because of the increased pressure on the abdomen.

Risk Factors for Osteoporosis

A risk factor is defined as a variable that is linked to an increased probability of developing a disease or adverse outcome. Recall that advanced age and being female increases the likelihood for developing osteoporosis. These factors present risks that should signal doctors and individuals to focus more attention on bone health, especially when the risk factors exist in combination. This is because not all risk factors for osteoporosis are out of your control. Risk factors such as age, gender, and race are biological risk factors, and are based on genetics that cannot be changed. By contrast, there are other risk factors that can be modified, such as physical activity, alcohol intake, and diet. The changeable risk factors for osteoporosis provide a mechanism to improve bone health even though some people may be genetically predisposed to the disease.



Figure 4.4.1: Image by Tomasz Sienick / CC BY- SA 3.0

Physical Activity

Bone is a living tissue, like muscle, that reacts to exercise by gaining strength. Physical inactivity lowers peak bone mass, decreases BMD at all ages, and is linked to an increase in fracture risk, especially in the elderly. Recall that mechanical stress increases bone remodeling and leads to increased bone strength and quality. Weight-bearing exercise puts mechanical stress on bones and therefore increases bone quality. Weight-bearing exercises such as strength training with weights, and aerobic weight-bearing activities, such as walking, running, and stair climbing are the most helpful for maintaining BMD. Certain aerobic exercises such as biking and swimming do not build bones, although they are very good for cardiovascular fitness.The stimulation of new bone growth occurs when a person participates in weight-bearing or resistance activities that force the body to work against gravity. Research has shown that this is an excellent way to activate osteoblasts to build more new bone. Conversely, physical inactivity lowers peak bone mass, decreases BMD at all ages, and is linked to an increase in fracture risk, especially in the elderly.

Being Underweight

Being underweight significantly increases the risk for developing osteoporosis. This is because people who are underweight often also have a smaller frame size and therefore have a lower peak bone mass. Maintaining a normal, healthy weight is important and acts as a form of weight-bearing exercise for the skeletal system as a person moves about. Additionally, inadequate nutrition negatively impacts peak bone mass and BMD. The most striking relationship between being underweight and bone health is seen in people with the psychiatric illness anorexia nervosa. Anorexia nervosa is strongly correlated with low peak bone mass and a low BMD. In fact, more than 50 percent of men and women who have this illness develop osteoporosis and sometimes it occurs very early in life.[12] Women with anorexia nervosa are especially at risk because they not only have inadequate nutrition and low body weight, but also the illness is also associated with estrogen deficiency.

Smoking, Alcohol, and Caffeine

Smoking cigarettes has long been connected to a decrease in BMD and an increased risk for osteoporosis and fractures. However, because people who smoke are more likely to be physically inactive and have poor diets, it is difficult to determine whether smoking itself causes osteoporosis. What is more, smoking is linked to earlier menopause and therefore the increased risk for developing osteoporosis among female smokers may also be attributed, at least in part, to having stopped estrogen production at an earlier age. A review of several studies, published in the British Medical Journal in 1997, reports that in postmenopausal women who smoked, BMD was decreased an additional 2 percent for every ten-year increase in age and that these women had a substantial increase in the incidence of hip fractures.[13]

Alcohol intake's effect on bone health is less clear. In some studies, excessive alcohol consumption was found to be a risk factor for developing osteoporosis, but the results of other studies suggests consuming two drinks per day is actually associated with an increase in BMD and a decreased risk for developing osteoporosis. The International Osteoporosis Foundation states that consuming more than two alcoholic drinks per day is a risk factor for developing osteoporosis and sustaining a hip fracture in both men and women.[14] Moreover, excessive alcohol intake during adolescence and young adulthood has a more profound effect on BMD and osteoporosis risk than drinking too much alcohol later in life.

Some studies have found that, similar to alcohol intake, excessive caffeine consumption has been correlated to decreased BMD, but in other studies moderate caffeine consumption actually improves BMD. Overall, the evidence that caffeine consumption poses a risk for developing osteoporosis is scant, especially when calcium intake is sufficient. Some evidence suggests that carbonated soft drinks negatively affect BMD and increase fracture risk. Their effects, if any, on bone health are not attributed to caffeine content or carbonation. It is probable that any effects of the excessive consumption of soft drinks, caffeinated or not, on bone health can be attributed to the displacement of milk as a dietary source of calcium.

Nutrition

Ensuring adequate nutrition is a key component in maintaining bone health. Having low dietary intakes of calcium and vitamin D are strong risk factors for developing osteoporosis. Another key nutrient for bone health is protein. Remember that the protein collagen comprises almost one third of bone tissue. A diet inadequate in protein is a risk factor for osteoporosis. Multiple large observational studies have shown that diets high in protein increase BMD and reduce fracture risk and that diets low in protein correlate to decreased BMD and increased fracture risk. There has been some debate over whether diets super high in animal protein decreases bone quality by stimulating bone resorption and increasing calcium excretion in the urine. A review in the May 2008 issue of the American Journal of Clinical Nutrition concludes that there is more evidence that diets adequate in protein play a role in maximizing bone health and there is little consistent evidence that suggests high protein diets negatively affect bone health when calcium intake is adequate.[15]

Osteoporosis Prevention and Treatment

Although the symptoms of osteoporosis do not occur until old age, osteoporosis is referred to as a childhood disease with old-age consequences. Thus, preventing osteoporosis in old age begins with building strong bones when you are growing. Remember, the more bone mass a person has to start with, the greater the loss a person can withstand without developing osteopenia or osteoporosis. Growing and maintaining healthy bones requires good nutrition, adequate intake of minerals and vitamins that are involved in maintaining bone health, and weight-bearing exercise.

Prevention extends throughout life, and people with one or more risk factors for osteoporosis should have their BMD measured. The National Osteoporosis Foundation recommends the following groups of people get BMD screening:[16]

- Women who are sixty-five or older
- Men who are seventy or older
- Women and men who break a bone after age fifty
- Women going through menopause with other risk factors
- Men fifty to sixty-nine years of age with risk factors

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4.5: Threats to Health

Chronic Diseases

Chronic diseases are ongoing, life-threatening, and life-altering health challenges. They are the leading cause of death worldwide. Chronic conditions are increasing in frequency. They cause significant physical and emotional suffering and are an impediment to economic growth and vitality. It is important, now more than ever, to understand the different risk factors for chronic disease and to learn how to prevent their development.

The Risk Factors of Chronic Disease

A risk factor is a signal that your chances for acquiring a chronic disease may be increased. You might liken a risk factor to the flags that lifeguards sometimes set up at beaches. When you see these flags, you know immediately that swimming within the marked areas could be hazardous, and that if you choose to swim within these parameters anyway, you are doing so at your own risk. But, if you heed the warnings, you are taking the necessary step to protect your safety and health. Similarly, risk factors are warning signs that coincide with the development and progression of disease. However, risk factors are not a 100-percent guarantee that a person will develop a chronic disease, only that the conditions are right. For example, if a person gets sick with the flu, we can say with certainty that the illness was caused by a virus. However, we cannot say that a sedentary lifestyle caused the onset of cardiovascular disease in a patient, because a risk factor indicates a correlation, not a causation.

Chronic disease usually develops alongside a combination of the following risk factors: genetics, a prior disease such as obesity or hypertension, dietary and lifestyle choices, and environmental problems. Risk factors such as genetics and age cannot be changed. However, some risk factors can be altered to promote health and wellness,such as diet. For example, a person who continuously eats a diet high in sugars, saturated fats, and red meat is at risk for becoming obese and developing Type 2 diabetes, cardiovascular disease, or several other conditions. Making more healthy dietary choices can greatly reduce that risk. Being a woman over age sixty-five is a risk factor for developing osteoporosis, but that cannot be changed. Also, people without a genetic predisposition for a particular chronic illness can still develop it. Not having a genetic predisposition for a chronic disease is not a guarantee of immunity.

Identifying Your Risk Factors

To estimate your own risk factors for developing certain chronic diseases, search through your family's medical history. What diseases do you note showing up among close blood relatives? At your next physical, pay attention to your blood tests and ask the doctor if any results are out of normal range. It is also helpful to note your vital signs, particularly your blood pressure and resting heart rate. In addition, you may wish to keep a food diary to make a note of the dietary choices that you make on a regular basis and be aware of foods that are high in saturated fat, among other unhealthy options. As a general rule, it is important to look for risk factors that you can modify to promote your health. For example, if you discover that your grandmother, aunt, and uncle all suffered from high blood pressure, then you may decide to avoid a high sodium diet. Identifying your risk factors can arm you with the information you need to help ward off disease.

The Crisis of Obesity

Excessive weight gain has become an epidemic. According to the National Institutes of Health, over two-thirds of American adults are overweight, and one in three is obese. Obesity in particular puts people at risk for a host of complications, including Type 2 diabetes, heart disease, high cholesterol, hypertension, osteoarthritis, and some forms of cancer. The more overweight a person is, the greater his or her risk of developing life-threatening complications. There is no single cause of obesity and no single way to treat it. However, a healthy, nutritious diet is generally the first step, including consuming more fruits and vegetables, whole grains, and lean meats and dairy products.[1]

Cardiovascular Disease

Throughout the remainder of this section, we will examine some of the more prevalent chronic diseases, their risk factors, and the choices that can help to discourage their development or progression. Let's begin with cardiovascular disease. According to the Centers for Disease Control and Prevention (CDC), heart disease is the leading cause of death in the United States.[2]

The disease generally starts with atherosclerosis, or a hardening of the arteries, a chronic condition so common that most people show signs of it by the time they turn thirty. Arteries start to narrow and harden when fats accumulate along their inner walls and

form plaques. A plaque is made of fat, cholesterol, calcium, and other substances found in blood.

Plaque formation causes arteries to narrow and harden, which elevates blood pressure because the vessels can't expand effectively to accommodate blood pulses. Higher blood pressure strains the heart and causes more damage. Arterial walls can become so weakened due to high blood pressure that they balloon and form what is known as an aneurysm. If the aneurysm bursts, it becomes a life-threatening event. The plaques themselves can also rupture due to a spike in blood pressure or a tremor along an arterial wall, and the body responds to this perceived injury by forming blood clots. These clots are serious health threats, whether they are stationary (a thrombus) or moving (an embolus). A stable clot can slowly kill off surrounding tissue, or grow so big that it blocks blood circulation and causes thrombosis. When a moving clot becomes stuck in an artery too small for its passage, it cuts off blood flow and causes cell death. This is referred to as an embolism. Blood clots in heart and brain arteries can cause heart attacks or strokes.

Table 4.5.1: The Risk Factors for Cardiovascular Disease

Unmodifiable Risk Factors	Modifiable Risk Factors
• Age. Risk increases for men at forty-five, and for women at fifty-five. • Sex. Men have a higher risk than women, though the risk for women steeply rises after menopause. • Family history. The more family members who have heart disease, the greater the risk.	• Cigarette smoking. Nicotine constricts blood vessels, and carbon monoxide damages their inner lining, which increases the risk of atherosclerosis. • Obesity. Excess weight worsens other risk factors. • Diabetes. This condition is associated with an increased risk of heart disease. Both types have certain risk factors in common, including obesity and high blood pressure. • Physical inactivity. Lack of exercise is associated with heart disease. • Cholesterol levels. High levels of blood cholesterol can increase the risk. A high level of low-density lipoprotein (LDL), or the "bad" cholesterol, is a common contributing factor. However, a low level of high-density lipoprotein (HDL), or "good" cholesterol, can also promote atherosclerosis.

Steps to Reducing the Risk of Cardiovascular Disease

Diet and nutrition can play a significant role in reducing the risk of cardiovascular disease. It is helpful to lower sodium intake, increase consumption of dietary fiber, and limit consumption of saturated fat, which promotes plaque formation. In addition, it is important to replace refined starches and added sugar, which can boost triglycerides, with whole grains, fruits, and vegetables. Eating foods rich in omega-3 fatty acids, especially fish, using alcohol in moderation, and opting for low or no-fat dairy products can all help reduce your cardiovascular disease risk. Emphasizing vegetable-based sources of protein, such as beans and legumes, can be beneficial, as well as consuming more soy products. It is also important to maintain a healthy weight and avoid smoking or chewing tobacco.

Hypertension

Chronic high blood pressure, also known as hypertension, is a significant health hazard affecting one out of three adults in the United States.[3] This chronic condition is a major cause of heart attacks and strokes, yet it has no symptoms until blood pressure reaches very high levels, which is why it is known as "the silent killer." The only way to find out if you have high blood pressure is to get an accurate reading of your resting blood pressure rate, which is best done by a medical professional and should be monitored regularly.

High blood pressure is such an important factor in cardiovascular disease, that keeping it within a healthy range is vitally important. Blood pressure readings consist of two numbers. The top number measures systolic pressure (when the heart contracts) and the bottom number measures diastolic pressure (when the heart is at rest). The key blood pressure numbers to keep in mind are:

- Ideal. 120 over 80 or below
- Prehypertension. Higher than 120 over 80 and lower than 139 over 89
- Hypertension. Greater than 139 over 89

Table 4.5.2: The Risk Factors for Hypertension

Unmodifiable Risk Factors	Modifiable Risk Factors
• Age. After fifty-five, the risk of developing high blood pressure is 90 percent. • Race. African-Americans are more likely to develop hypertension, manifest it at a younger age, and have higher blood pressure readings. • Family history. There is a strong genetic component to high blood pressure, and an individual's risk goes up along with the number of family members who have hypertension.	• Weight. Roughly 60 percent of people with hypertension are obese. • Sodium consumption. The more salt in a person's diet, the more likely they are to have high blood pressure. • Alcohol. Drinking more than two drinks per day for men and one drink for women increases the likelihood of hypertension. • Diet. In addition to salt and alcohol consumption, other dietary factors increase chances of developing hypertension.

Steps to Reducing the Risk of High Blood Pressure

Although it is not possible to change one's age or genetics, there are actions that people can take to decrease their risk of hypertension. Techniques to reduce blood pressure include becoming physically active, maintaining a healthy weight, reducing sodium intake below 2,400 milligrams per day (or below 1,500 milligrams if you are in a high-risk group or already have been diagnosed with hypertension), using alcohol moderately, and following the DASH diet. Additionally, vitamin C, calcium, and potassium have all been shown to promote healthy blood pressure. It is also vital to monitor your blood pressure levels on a regular basis. Prompt intervention when readings rise above the ideal level (120 over 80) can save lives, which is why everyone should know the status of their blood pressure.

Cancer

More than one hundred diseases are classified as different forms of cancer, all of them characterized by the uncontrolled growth of abnormal cells. Cancer is triggered by mutations in a cell's genetic material. The cause of these changes may be inherited, or it may result from exposure to carcinogens, which are agents that can cause cancer. Carcinogens include chemicals, viruses, certain medical treatments such as radiation, pollution, or other substances and exposures that are known or suspected to cause cancer.[4] The National Institutes of Health has classified fifty-four different compounds as known cancer-causing agents in humans.[5]

Under normal conditions, a healthy cell will either repair any damage that has been done or self destruct so that no future cells will be affected. Cells become cancerous when their DNA is damaged, but they do not self-destruct or stop reproducing as normal cells would. As these abnormal cells continue their rapid growth, in most cancers they coalesce in a mass called a tumor. Cancer cells can overwhelm healthy cells and interfere with the healthy functioning of the body. They can also invade other organs and spread throughout the body in a process known as metastasis. Scientists and the medical community are giving considerable attention to the early stages of cancer, from the moment a healthy cell is exposed to a carcinogen to the point where cells with damaged DNA are replicating out of control. Intervention at any of these early stages could prove to be quite beneficial, because it is thought that most cancers are the result of lifestyle choices and environmental exposure.

The risk factors for different cancers can vary. For example, exposure to ultraviolet radiation from the sun and from tanning beds is a risk factor for skin cancer, while exposure to asbestos is a risk factor for mesothelioma cancer. Table 4.5.3 shows some common risk factors for a number of different types of cancer.

Table 4.5.3: The Risk Factors for Cancer

Unmodifiable Risk Factors	Modifiable Risk Factors

Unmodifiable Risk Factors	Modifiable Risk Factors
• Age. Most cancers occur in people over the age of sixty-five. However, people of all ages, including children, can get cancer. • Family history. Certain types of cancer have a genetic link. However, environmental factors may also play a part.	• Tobacco. Smoking or chewing tobacco greatly increases the risk for certain cancers, including cancer of the lungs, bladder, cervix, kidneys, mouth, and pancreas. • Alcohol. Drinking alcohol is linked to cancers of the mouth, throat, esophagus, and breast, as well as to cancers of the neck and head. • Obesity. Linked to cancers of the colon, uterus, pancreas, esophagus, kidney, and breast. • Cooking techniques. Grilling, smoking, and preparing meat at high temperatures forms carcinogens. • Red meat. The risk of colon cancer seems to increase with the consumption of red meat and processed meat. • Cured meats. According to a recent study, there is a mild risk of pancreatic cancer with the consumption of cured meats, such as sausage, pepperoni, bacon, ham, smoked turkey, salami, and hot dogs. • Physical inactivity. Linked to colon, breast, and other cancers. • Exposure to chemicals. People who have jobs that expose them to chemicals on a regular basis, such as construction workers and painters, have an increased risk of cancer. • Viruses or bacteria. Certain viruses or bacteria may increase the risk of developing cancer. For example, human papillomaviruses, which are sexually transmitted, are the primary cause of cervical cancer.

Steps to Reducing the Risk of Cancer

According to the American Cancer Society, half of all American men and one-third of American women will be diagnosed with some form of cancer in their lifetime.[6] Although cancer is one of the leading causes of death worldwide, ongoing research and innovations in treatment have improved the outlook for cancer patients to the point where millions now survive or live with cancer, making it a chronic disease.

The American Institute for Cancer Research (AICR) has published guidelines for preventing cancer and staying healthy. They include several dietary and lifestyle choices, such as participating in physical activity for thirty minutes per day or more, and maintaining a healthy weight. In addition, AICR recommends consuming a plant-based diet.[7]

Several epidemiological studies have found a link between eating plenty of fruits and vegetables and a low incidence of certain cancers. Fruits and vegetables containing a wide variety of nutrients and phytochemicals may either prevent or reduce the oxidative damage to cell structures. Cruciferous vegetables, such as cauliflower, broccoli, and Brussels sprouts, may also reduce the risk of certain cancers, such as endometrial, esophageal, and others. Also, studies have shown that the more fiber you have in your diet, the lower your risk of colon cancer.

Supplementation may also be helpful to a limited degree. Vitamin D and antioxidants have been linked to lowering the risk of some cancers (however taking an iron supplement may promote others), but, obtaining vital nutrients from food first is the best way to help prevent or manage cancer. In addition, regular and vigorous exercise can lower the risk of breast and colon cancers, among others. Also, wear sunblock, stay in the shade, and avoid the midday sun to protect yourself from skin cancer, which is one of the most common kinds of cancer.[8]

Diabetes

What Is Diabetes?

Diabetes is one of the top three diseases in America. It affects millions of people and causes tens of thousands of deaths each year. Diabetes is a metabolic disease of insulin deficiency and glucose over-sufficiency. Like other diseases, genetics, nutrition,

environment, and lifestyle are all involved in determining a person's risk for developing diabetes. One sure way to decrease your chances of getting diabetes is to maintain an optimal body weight by adhering to a diet that is balanced in carbohydrate, fat, and protein intake. There are three different types of diabetes: Type 1 diabetes, Type 2 diabetes, and gestational diabetes.

Type 1 Diabetes

Type 1 diabetes is a metabolic disease in which insulin-secreting cells in the pancreas are killed by an abnormal response of the immune system, causing a lack of insulin in the body. Its onset typically occurs before the age of thirty. The only way to prevent the deadly symptoms of this disease is to inject insulin under the skin.

A person with Type 1 diabetes usually has a rapid onset of symptoms that include hunger, excessive thirst and urination, and rapid weight loss. Because the main function of glucose is to provide energy for the body, when insulin is no longer present there is no message sent to cells to take up glucose from the blood. Instead, cells use fat and proteins to make energy, resulting in weight loss. If Type 1 diabetes goes untreated individuals with the disease will develop a life-threatening condition called ketoacidosis. This condition occurs when the body uses fats and not glucose to make energy, resulting in a build-up of ketone bodies in the blood. It is a severe form of ketosis with symptoms of vomiting, dehydration, rapid breathing, and confusion and eventually coma and death. Upon insulin injection these severe symptoms are treated and death is avoided. Unfortunately, while insulin injection prevents death, it is not considered a cure. People who have this disease must adhere to a strict diet to prevent the development of serious complications. Type 1 diabetics are advised to consume a diet low in the types of carbohydrates that rapidly spike glucose levels (high-GI foods), to count the carbohydrates they eat, to consume healthy-carbohydrate foods, and to eat small meals frequently. These guidelines are aimed at preventing large fluctuations in blood glucose. Frequent exercise also helps manage blood-glucose levels. Type 1 diabetes accounts for between 5 and 10 percent of diabetes cases.

Type 2 Diabetes

The other 90 to 95 percent of diabetes cases are Type 2 diabetes. Type 2 diabetes is defined as a metabolic disease of insulin insufficiency, but it is also caused by muscle, liver, and fat cells no longer responding to the insulin in the body (Figure 18.4 . In brief, cells in the body have become resistant to insulin and no longer receive the full physiological message of insulin to take up glucose from the blood. Thus, similar to patients with Type 1 diabetes, those with Type 2 diabetes also have high blood-glucose levels.

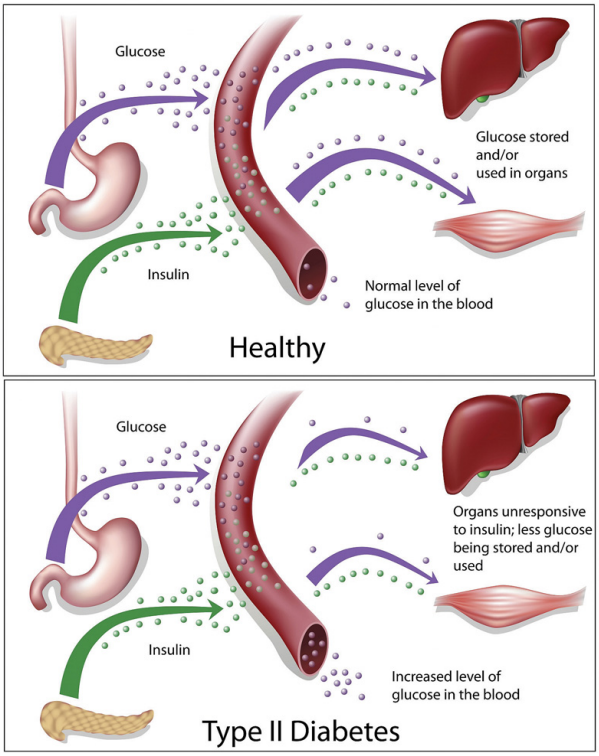


Figure 4.5.1: Healthy Individuals and Type 2 Diabetes. Image by Allison Calabrese / CC BY 4.0

For Type 2 diabetics, the onset of symptoms is more gradual and less noticeable than for Type 1 diabetics. The first stage of Type 2 diabetes is characterized by high glucose and insulin levels. This is because the insulin-secreting cells in the pancreas attempt to compensate for insulin resistance by making more insulin. In the second stage of Type 2 diabetes, the insulin-secreting cells in the pancreas become exhausted and die. At this point, Type 2 diabetics also have to be treated with insulin injections. Healthcare providers is to prevent the second stage from happening. As with Type 1 diabetes, chronically high-glucose levels cause big detriments to health over time, so another goal for patients with Type 2 diabetes is to properly manage their blood-glucose levels. The front-line approach for treating Type 2 diabetes includes eating a healthy diet and increasing physical activity.

The Centers for Disease Control Prevention (CDC) estimates that as of 2010, 25.8 million Americans have diabetes, which is 8.3 percent of the population.[9] In 2007 the cost of diabetes to the United States was estimated at $174 billion.[10] The incidence of Type 2 diabetes has more than doubled in America in the past thirty years and the rise is partly attributed to the increase in obesity in this country. Genetics, environment, nutrition, and lifestyle all play a role in determining a person's risk for Type 2 diabetes. We have the power to change some of the determinants of disease but not others. The Diabetes Prevention Trial that studied lifestyle and drug interventions in more than three thousand participants who were at high risk for Type 2 diabetes found that intensive lifestyle intervention reduced the chances of getting Type 2 diabetes by 58 percent.[11]

Gestational Diabetes

During pregnancy some women develop gestational diabetes. Gestational diabetes is characterized by high blood-glucose levels and insulin resistance. The exact cause is not known but does involve the effects of pregnancy hormones on how cells respond to insulin. Gestational diabetes can cause pregnancy complications and it is common practice for healthcare practitioners to screen pregnant women for this metabolic disorder. The disorder normally ceases when the pregnancy is over, but the National Diabetes Information Clearing House notes that women who had gestational diabetes have between a 40 and 60 percent likelihood of developing Type 2 diabetes within the next ten years.[12] Gestational diabetes not only affects the health of a pregnant woman but also is associated with an increased risk of obesity and Type 2 diabetes in her child.

Prediabetes

As the term infers, prediabetes is a metabolic condition in which people have moderately high glucose levels, but do not meet the criteria for diagnosis as a diabetic. Over seventy-nine million Americans are prediabetic and at increased risk for Type 2 diabetes and cardiovascular disease.[13] The National Diabetes Information Clearing House reports that 35 percent of adults aged twenty and older, and 50 percent of those over the age of sixty-five have prediabetes.[14]

Long-Term Health Consequences of Diabetes

The long-term health consequences of diabetes are severe. They are the result of chronically high glucose concentrations in the blood accompanied by other metabolic abnormalities such as high blood-lipid levels. People with diabetes are between two and four times more likely to die from cardiovascular disease. Diabetes is the number one cause of new cases of blindness, lower-limb amputations, and kidney failure. Many people with diabetes develop peripheral neuropathy, characterized by muscle weakness, loss of feeling and pain in the lower extremities. More recently, there is scientific evidence to suggest people with diabetes are also at increased risk for Alzheimer's disease.

Diabetes Treatment

Keeping blood-glucose levels in the target range (70–130 mg/dL before a meal) requires careful monitoring of blood-glucose levels with a blood-glucose meter, strict adherence to a healthy diet, and increased physical activity. Type 1 diabetics begin insulin injections as soon as they are diagnosed. Type 2 diabetics may require oral medications and insulin injections to maintain blood-glucose levels in the target range. The symptoms of high blood glucose, also called hyperglycemia, are difficult to recognize, diminish in the course of diabetes, and are mostly not apparent until levels become very high. The symptoms are increased thirst and frequent urination. Having too low blood glucose levels, known as hypoglycemia, is also detrimental to health. Hypoglycemia is more common in Type 1 diabetics and is most often caused by injecting too much insulin or injecting it at the wrong time. The symptoms of hypoglycemia are more acute including shakiness, sweating, nausea, hunger, clamminess, fatigue, confusion, irritability, stupor, seizures, and coma. Hypoglycemia can be rapidly and simply treated by eating foods containing about ten to twenty grams of fast-releasing carbohydrates. If symptoms are severe a person is either treated by emergency care providers with an intravenous solution of glucose or given an injection of glucagon, which mobilizes glucose from glycogen in the liver. Some people who are not diabetic may experience reactive hypoglycemia. This is a condition in which people are sensitive to the intake of sugars, refined starches, and high GI foods. Individuals with reactive hypoglycemia have some symptoms of hypoglycemia.

Symptoms are caused by a higher than normal increase in blood-insulin levels. This rapidly decreases blood-glucose levels to a level below what is required for proper brain function.

The major determinants of Type 2 diabetes that can be changed are overnutrition and a sedentary lifestyle. Therefore, reversing or improving these factors by lifestyle interventions markedly improve the overall health of Type 2 diabetics and lower blood-glucose levels. In fact it has been shown that when people are overweight, losing as little as nine pounds (four kilograms) decreases blood-glucose levels in Type 2 diabetics. The Diabetes Prevention Trial demonstrated that by adhering to a diet containing between 1,200 and 1,800 kilocalories per day with a dietary fat intake goal of less than 25 percent and increasing physical activity to at least 150 minutes per week, people at high risk for Type 2 diabetes achieved a weight loss of 7 percent and significantly decreased their chances of developing Type 2 diabetes.[15]

The American Diabetes Association (ADA) has a website that provides information and tips for helping diabetics answer the question, “What Can I Eat”. In regard to carbohydrates the ADA recommends diabetics keep track of the carbohydrates they eat and set a limit. These dietary practices will help keep blood-glucose levels in the target range.

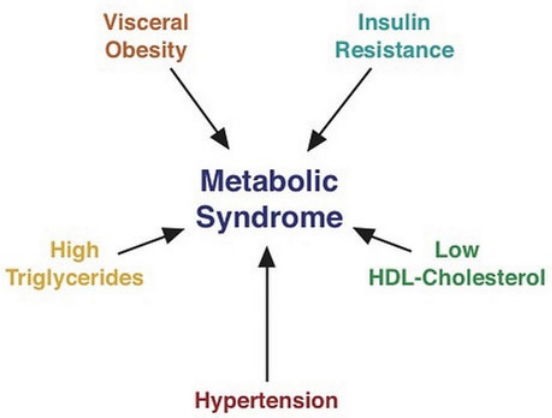


Figure 4.5.2: Metabolic Syndrome: A Combination of Risk Factors Increasing the Chances for Chronic Disease. Image by Allison Calabrese / CC BY 4.0

Having more than one risk factor for Type 2 diabetes substantially increases a person’s chances for developing the disease. Metabolic syndrome refers to a medical condition in which people have three or more risk factors for Type 2 diabetes and cardiovascular disease. According to the International Diabetes Federation (IDF) people are diagnosed with this syndrome if they have central (abdominal) obesity and any two of the following health parameters: triglycerides greater than 150 mg/dL; high density lipoproteins (HDL) lower than 40 mg/dL; systolic blood pressure above 100 mmHg, or diastolic above 85 mmHg; fasting blood-glucose levels greater than 100 mg/dL.[16] The IDF estimates that between 20 and 25 percent of adults worldwide have metabolic syndrome. Studies vary, but people with metabolic syndrome have between a 9 and 30 times greater chance for developing Type 2 diabetes than those who do not have the syndrome.[17]

Everyday Connection

In 2010, the Pacific Islands Health Officers Association declared a regional state of health emergency for the epidemic of chronic diseases in the United States Affiliated Pacific (USAP). Due to the high risk factors that many of these Pacific Islanders, the leading cause of mortality of adults in the USAP from chronic diseases. To learn more about this declaration, visit www.pihoa.org/fullsite/newsroom/wp-content/uploads/downloads/2012/06/NCD_Emergency_Declaration.pdf

Disease Prevention and Management

Eating fresh, healthy foods not only stimulates your taste buds, but also can improve your quality of life and help you to live longer. As discussed, food fuels your body and helps you to maintain a healthy weight. Nutrition also contributes to longevity and plays an important role in preventing a number of diseases and disorders, from obesity to cardiovascular disease. Some dietary changes can also help to manage certain chronic conditions, including high blood pressure and diabetes. A doctor or a nutritionist can provide guidance to determine the dietary changes needed to ensure and maintain your health.

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4.6: Undernutrition, Overnutrition, and Malnutrition

For many, the word “malnutrition” produces an image of a child in a third-world country with a bloated belly, and skinny arms and legs. However, this image alone is not an accurate representation of the state of malnutrition. For example, someone who is 150 pounds overweight can also be malnourished.

Malnutrition refers to one not receiving proper nutrition and does not distinguish between the consequences of too many nutrients or the lack of nutrients, both of which impair overall health. Undernutrition is characterized by a lack of nutrients and insufficient energy supply, whereas overnutrition is characterized by excessive nutrient and energy intake. Overnutrition can result in obesity, a growing global health threat. Obesity is defined as a metabolic disorder that leads to an overaccumulation of fat tissue.

Although not as prevalent in America as it is in developing countries, undernutrition is not uncommon and affects many subpopulations, including the elderly, those with certain diseases, and those in poverty. Many people who live with diseases either have no appetite or may not be able to digest food properly. Some medical causes of malnutrition include cancer, inflammatory bowel syndrome, AIDS, Alzheimer’s disease, illnesses or conditions that cause chronic pain, psychiatric illnesses, such as anorexia nervosa, or as a result of side effects from medications. Overnutrition is an epidemic in the United States and is known to be a risk factor for many diseases, including Type 2 diabetes, cardiovascular disease, inflammatory disorders (such as rheumatoid arthritis), and cancer.

Health Risks of Being Underweight

The 2003–2006 National Health and Nutrition Examination Survey (NHANES) estimated that 1.8 percent of adults and 3.3 percent of children and adolescents in the United States are underweight.[1]

Being underweight is linked to nutritional deficiencies, especially iron-deficiency anemia, and to other problems such as delayed wound healing, hormonal abnormalities, increased susceptibility to infection, and increased risk of some chronic diseases such as osteoporosis. In children, being underweight can stunt growth. The most common underlying cause of underweight in America is inadequate nutrition. Other causes are wasting diseases, such as cancer, multiple sclerosis, tuberculosis, and eating disorders. People with wasting diseases are encouraged to seek nutritional counseling, as a healthy diet greatly affects survival and improves responses to disease treatments. Eating disorders that result in underweight affect about eight million Americans (seven million women and one million men).

Anorexia Nervosa

Anorexia nervosa, more often referred to as “anorexia,” is a psychiatric illness in which a person obsesses about their weight and about food that they eat. Anorexia results in extreme nutrient inadequacy and eventually to organ malfunction. Anorexia is relatively rare—the National Institute of Mental Health (NIMH) reports that 0.9 percent of females and 0.3 percent of males will have anorexia at some point in their lifetime, but it is an extreme example of how an unbalanced diet can affect health.[2]

Anorexia frequently manifests during adolescence and it has the highest rate of mortality of all mental illnesses. People with anorexia consume, on average, fewer than 1,000 kilocalories per day and exercise excessively. They are in a tremendous caloric imbalance. Moreover, some may participate in binge eating, self-induced vomiting, and purging with laxatives or enemas. The very first time a person starves him- or herself may trigger the onset of anorexia. The exact causes of anorexia are not completely known, but many things contribute to its development including economic status, as it is most prevalent in high-income families. It is a genetic disease and is often passed from one generation to the next. Pregnancy complications and abnormalities in the brain, endocrine system, and immune system may all contribute to the development of this illness.

The primary signs of anorexia are fear of being overweight, extreme dieting, an unusual perception of body image, and depression. The secondary signs and symptoms of anorexia are all related to the caloric and nutrient deficiencies of the unbalanced diet and include excessive weight loss, a multitude of skin abnormalities, diarrhea, cavities and tooth loss, osteoporosis, and liver, kidney, and heart failure. There is no physical test that can be used to diagnose anorexia and distinguish it from other mental illnesses. Therefore a correct diagnosis involves eliminating other mental illnesses, hormonal imbalances, and nervous system abnormalities. Eliminating these other possibilities involves numerous blood tests, urine tests, and x-rays. Coexisting organ malfunction is also examined. Treatment of any mental illness involves not only the individual, but also family, friends, and a psychiatric counselor. Treating anorexia also involves a dietitian, who helps to provide dietary solutions that often have to be adjusted over time. The goals of treatment for anorexia are to restore a healthy body weight and significantly reduce the behaviors associated with causing

the eating disorder. Relapse to an unbalanced diet is high. Many people do recover from anorexia, however most continue to have a lower-than-normal body weight for the rest of their lives.

Bulimia Nervosa

Bulimia nervosa, like anorexia, is a psychiatric illness that can have severe health consequences. The NIMH reports that 0.5 percent of females and 0.1 percent of males will have bulimia nervosa, or otherwise known as bulimia, at some point in their lifetime.[3]

Bulimia is characterized by episodes of eating large amounts of food followed by purging, which is accomplished by vomiting and with the use of laxatives and diuretics. Unlike people with anorexia, those with bulimia often have a normal weight, making the disorder more difficult to detect and diagnose. The disorder is characterized by signs similar to anorexia such as fear of being overweight, extreme dieting, and bouts of excessive exercise. Secondary signs and symptoms include gastric reflux, severe erosion of tooth enamel, dehydration, electrolyte imbalances, lacerations in the mouth from vomiting, and peptic ulcers. Repeated damage to the esophagus puts people with bulimia at an increased risk for esophageal cancer. The disorder is also highly genetic, linked to depression and anxiety disorders, and most commonly occurs in adolescent girls and young women. Treatment often involves antidepressant medications and, like anorexia, has better results when both the family and the individual with the disorder participate in nutritional and psychiatric counseling.

Binge-Eating Disorder

Similar to those who experience anorexia and bulimia, people who have a binge-eating disorder have lost control over their eating. Binge-eating disorder is not currently diagnosed as a distinct psychiatric illness, although there is a proposal from the American Psychiatric Association to categorize it more specifically. People with binge-eating disorder will periodically overeat to the extreme, but their loss of control over eating is not followed by fasting, purging, or compulsive exercise. As a result, people with this disorder are often overweight or obese, and their chronic disease risks are those linked to having an abnormally high body weight such as hypertension, cardiovascular disease, and Type 2 diabetes. Additionally, they often experience guilt, shame, and depression. Binge-eating disorder is commonly associated with depression and anxiety disorders. According to the NIMH, binge-eating disorder is more prevalent than anorexia and bulimia, and affects 3.5 percent of females and 2.0 percent of males at some point during their lifetime.[4] Treatment often involves antidepressant medication as well as nutritional and psychiatric counseling.

Orthorexia Nervosa

Orthorexia nervosa was coined in 1997 by physician Steven Bratman.[5] The term uses “ortho,” in its meaning as straight, correct and true and refers to a fixation on eating proper food.[6] Fixation on ‘healthy eating’ by those with orthorexia nervosa often results in behaviors that end up damaging one’s well-being such as extreme weight loss or a refusal to dine out with friends. Orthorexia nervosa like anorexia nervosa involves restriction of the amount and variety of foods eaten, however those with orthorexia nervosa do not have an incessant fear of weight gain but instead have an obsession with “feeling pure, healthy and natural.”[7] People affected by orthorexia nervosa tend to follow diets tied to a philosophy or theory and believe that their theory of eating is the best.[8][9] Such diets often have a redemptive quality that involves denying oneself of “bad” or “wrong” foods.[10] In extreme cases, affected individuals may also fear contamination or harm from water and electricity leading them to use filters to purify their environment from electrical emissions. Orthorexia nervosa has similar physical consequences to anorexia nervosa despite the lack of motivation for weight loss by affected individuals.

Although awareness of orthorexia nervosa is increasing, it is not formally recognized in the Diagnostic Statistical Manual and thus it is difficult to get an estimate of how many persons are affected by orthorexia nervosa. Additionally, the lack of formal diagnostic criteria makes it impossible to know if orthorexia nervosa occurs with other types of existing disorders like anorexia or a form of obsessive-compulsive disorder (OCD) or if it’s a stand-alone eating disorder. Studies show that many persons with orthorexia nervosa also have OCD. Many experts view orthorexia nervosa as a variety of anorexia or OCD. Treatment usually involves psychotherapy and weight restoration as needed.[11] OCD may be a consequence of malnutrition, being underweight and a starved brain thus weight restoration may resolve the OCD.

Warning signs and symptoms of orthorexia nervosa:[12]

- Compulsive checking of ingredients lists and nutritional labels
- An increased concern about the health of ingredients
- Cutting out an increasing number of food groups such as all sugars, all carbohydrates, all dairy or all animal products
- An inability to eat anything but a narrow group of foods that are deemed ‘healthy’ or ‘pure’

- Unusual interest in the health of what others are eating
- Spending hours per day thinking about what food might be served at upcoming events
- Showing high levels of distress when ‘safe’ or ‘healthy’ foods are not available
- Obsessive following of food and ‘healthy lifestyle’ blogs on social media
- Body image concerns may or may not present

The Healing Process

With all wounds, from a paper cut to major surgery, the body must heal itself. Healing is facilitated through proper nutrition while malnutrition inhibits and complicates this vital process. The following nutrients are important for proper healing:[13]

- Vitamin A. Helps to enable the epithelial tissue (the thin outer layer of the body and the lining that protects your organs) and bone cells form.
- Vitamin C. Helps form collagen, an important protein in many body tissues.
- Protein. Facilitates tissue formation.
- Fats. Play a key role in the formation and function of cell membranes.
- Carbohydrates. Fuel cellular activity, supplying needed energy to support the inflammatory response that promotes healing.

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4.7: Food Insecurity

Addressing Hunger

Government agencies also play an important role in addressing hunger via federal food-assistance programs. The agencies provide debit cards (formerly distributed in the form of food vouchers or food stamps) to consumers to help them purchase food and they also provide other forms of aid to low-income adults and families who face hunger and nutritional deficits. This topic will be discussed in greater detail later in this chapter.

Hunger relates to appetite and is the body's response to a need for nourishment. Through stomach discomfort or intestinal rumbling, the body alerts the brain that it requires food. This uneasy sensation is easily addressed with a snack or a full meal. However, the term "hunger" also relates to a weakened condition that is a consequence of a prolonged lack of food. People who suffer from this form of hunger typically experience malnourishment, along with poor growth and development.

Hunger

Adequate food intake that meets nutritional requirements is essential to achieve a healthy, productive lifestyle. However, millions of people in North America, not to mention globally, go hungry and are malnourished each year due to a recurring and involuntary lack of food. The economic crisis of 2008 caused a dramatic increase in hunger across the United States.[1]

In 2010, 925 million people around the world were classified as hungry. Although this was a decrease from a historic high of more than one billion people from the previous year, it is still an unbearable number. Every night, millions and millions of people go to sleep hungry due to a lack of the money or resources needed to acquire an adequate amount of food. This graph shows the division of hungry people around the globe. A number of terms are used to categorize and classify hunger. Two key terms, food security and food insecurity, focus on status and affect hunger statistics. Another term, malnutrition, refers to the deficiencies that a hungry person experiences.

Food Security

Most American households are considered to be food secure, which means they have adequate access to food and consume enough nutrients to achieve a healthy lifestyle. However, a minority of US households experiences food insecurity at certain points during the year, which means their access to food is limited due to a lack of money or other resources. This graphic shows the percentage of food-secure and food-insecure households in the United States during the year 2010.

Food Insecurity

Food insecurity is defined as not having adequate access to food that meets nutritional needs. According to the USDA, about 48.8 million people live in food-insecure households and have reported multiple indications of food access problems. About sixteen million of those have "very low food security," which means one or more people in the household were hungry at some point over the course of a year due to the inability to afford enough food. The difference between low and very low food security is that members of low insecurity households have reported problems of food access, but have reported only a few instances of reduced food intake, if any.[2] African American and Hispanic households experience food insecurity at much higher rates than the national average.[3]

Households with limited resources employ a variety of methods to increase their access to adequate food. Some families purchase junk food and fast food—cheaper options that are also very unhealthy. Other families who struggle with food security supplement the groceries they purchase by participating in government assistance programs. They may also obtain food from emergency providers, such as food banks and soup kitchens in their communities.

Malnutrition

A person living in a food-insecure household may suffer from malnutrition, which results from a failure to meet nutrient requirements. This can occur as a result of consuming too little food or not enough key nutrients. There are two basic types of malnutrition. The first is macronutrient deficiency and relates to the lack of adequate protein, which is required for cell growth, maintenance, and repair. The second type of malnutrition is micronutrient deficiency and relates to inadequate vitamin and mineral intake.[4] Even people who are overweight or obese can suffer from this kind of malnutrition if they eat foods that do not meet all of their nutritional needs.

Worldwide, three main groups are most at risk of hunger: the rural poor in developing nations who also lack access to electricity and safe drinking water, the urban poor who live in expanding cities and lack the means to buy food, and victims of earthquakes, hurricanes, and other natural and man-made catastrophes.[5]

In the United States, there are additional subgroups that are at risk and are more likely than others to face hunger and malnutrition. They include low-income families and the working poor, who are employed but have incomes below the federal poverty level.

Senior citizens are also a major at-risk group. Many elderly people are frail and isolated, which affects their ability to meet their dietary requirements. In addition, many also have low incomes, limited resources, and difficulty purchasing or preparing food due to health issues or poor mobility. As a result, more than six million senior citizens in the United States face the threat of hunger.[6]

One of the groups that struggles with hunger are the millions of homeless people across North America. According to a recent study by the US Conference of Mayors, the majority of reporting cities saw an increase in the number of homeless families.[7] Hunger and homelessness often go hand-in-hand as homeless families and adults turn to soup kitchens or food pantries or resort to begging for food.

Rising hunger rates in the United States particularly affect children. Nearly one out of four children, or 21.6 percent of all American children, lives in a food-insecure household and spends at least part of the year hungry.[8] Hunger delays their growth and development and affects their educational progress because it is more difficult for hungry or malnourished students to concentrate in school. In addition, children who are undernourished are more susceptible to contracting diseases, such as measles and pneumonia.[9]

Government Programs

The federal government has established a number of programs that work to alleviate hunger and ensure that many low-income families receive the nutrition they require to live a healthy life. A number of programs were strengthened by the passage of the Healthy, Hunger-Free Kids Act of 2010. This legislation authorized funding and set the policy for several key core programs that provide a safety net for food-insecure children across the United States.

The federal poverty level (FPL) is used to determine eligibility for food-assistance programs. This monetary figure is the minimum amount that a family would need to acquire shelter, food, clothing, and other necessities. It is calculated based on family size and is adjusted for annual inflation. Although many people who fall below the FPL are unemployed, the working poor can qualify for food programs and other forms of public assistance if their income is less than a certain percentage of the federal poverty level, along with other qualifications.

USDA Food Assistance Programs

Government food and nutrition assistance programs that are organized and operated by the USDA work to increase food security. They provide low-income households with access to food, the tools for consuming a healthy diet, and education about nutrition. The USDA monitors the extent and severity of food insecurity via an annual survey. This contributes to the efficiency of food assistance programs as well as the effectiveness of private charities and other initiatives aimed at reducing food insecurity.[10]

The Supplemental Nutrition Assistance Program

Formerly known as the Food Stamp Program, the Supplemental Nutrition Assistance Program (SNAP) provides monthly benefits for low-income households to purchase approved food items at authorized stores. Clients qualify for the program based on available household income, assets, and certain basic expenses. In an average month, SNAP provides benefits to more than forty million people in the United States.[11] The program provides Electronic Benefit Transfers (EBT) which work similarly to a debit card. Clients receive a card with a certain allocation of money for each month that can be used only for food. In 2010, the average benefit was about $134 per person, per month and total federal expenditures for the program were $68.2 billion.[12]

The Special, Supplemental Program for Women, Infants, and Children

The Special, Supplemental Program for Women, Infants and Children (WIC) provides food packages to pregnant and breastfeeding women, as well as to infants and children up to age five, to promote adequate intake for healthy growth and development. Most state WIC programs provide vouchers that participants use to acquire supplemental packages at authorized stores. In 2010, WIC served approximately 9.2 million participants per month at an average monthly cost of about forty-two dollars per person.[13]

The National School Lunch Program

The National School Lunch Program (NSLP) and School Breakfast Program (SBP) ensure that children in elementary and middle schools receive at least one healthy meal each school day, or two if both the NSLP and SBP are provided. According to the USDA, these programs operate in over 101,000 public and nonprofit private schools and residential child-care institutions.[14] In 2010, the programs provided meals to an average of 31.6 million children each school day. Fifty-six percent of the lunches served were free, and an additional 10 percent were provided at reduced prices.

Meals on Wheels

An organization known as Meals on Wheels delivers meals to elderly people who have difficulty buying or making their own food because of poor health or limited mobility. It is the oldest and largest program dedicated to addressing the nutritional needs of senior citizens. Each day, Meals on Wheels volunteers deliver more than one million meals across the United States. The first Meals on Wheels program began in Philadelphia in the 1950s. In the decades since, the organization has expanded into a vast network that serves the elderly in all fifty states and several US territories. Today, Meals on Wheels remains committed to ending hunger among the senior citizen community.[15]

Nutrition and Your Health

The adage, "you are what you eat," seems to be more true today than ever. In recent years, consumers have become more conscientious about the decisions they make in the supermarket. Organically grown food is the fastest growing segment of the food industry. Also, farmers' markets and chains that are health-food-oriented are thriving in many parts of North America. Shoppers have begun to pay more attention to the effect of food on their health and well-being. That includes not only the kinds of foods that they purchase, but also the manner in which meals are cooked and consumed. The preparation of food can greatly affect its nutritional value. Also, studies have shown that eating at a table with family members or friends can promote both health and happiness.

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4.8: Careers in Nutrition

If you are considering a career in nutrition, it is important to understand the opportunities that may be available to you. Both registered dietitians (RD) and nutritionists provide nutrition-related services to people in the private and public sectors. A RD is a healthcare professional who has credentials from the Commission on Dietetic Registration and can provide nutritional care in the areas of health and wellness for both individuals and groups. A nutritionist is an unregistered professional who may have acquired the knowledge via other avenues. RDs are nutrition professionals who work to apply nutritional science, using evidence-based best practices, to help people nourish their bodies and improve their lives.

Becoming a RD requires a Bachelor's or Master's degree in dietetics from an accredited program, including courses in biology, chemistry, biochemistry, microbiology, anatomy and physiology, nutrition, and food-service management. Other suggested courses include economics, business, statistics, computer science, psychology, and sociology. In addition, people who pursue this path must complete a dietetic internship and pass a national exam. Also, some states have licensure that requires additional forms and documentation. To become a dietetic technician registered you must complete an undergraduate dietetic program and pass a national exam. Forty-seven states have licensure requirements for RDs and nutritionists. A few remaining states do not have laws that regulate this profession.[1] Go to https://www.cdrnet.org/certifications to learn more.

Working in Nutrition

Registered dietitians (RDs)/registered dietitians nutritionist (RDNs) and nutritionists plan food and nutrition programs, promote healthy eating habits, and recommend dietary modifications based on the needs of individuals or groups. For example, an RD/RDN might teach a patient with hypertension how to follow the DASH diet and reduce their sodium intake. Nutrition-related careers can be extremely varied. Some individuals work in the government, while others are solely in the private sectors (i.e., private practice, worksite wellness, hospitals, outpatient clinics, etc). Some jobs in nutrition focus on working with elite athletes, while others provide guidance to patients with long-term, life-threatening diseases. But no matter the circumstance or the clientele, working in the field of diet and nutrition focuses on helping people improve their dietary habits by translating nutritional science and evidence-based recommendations into food choices.

In the public sector, careers in nutrition span from government work to community outreach. RDs who work for the government may become involved with federal food programs, federal agencies, communication campaigns, or creating and analyzing public policy. On the local level, clinical careers include working in hospitals and nursing-care facilities. This requires creating meal plans and providing nutritional guidance to help patients restore their health or manage chronic conditions. Clinical dietitians also confer with doctors and other health-care professionals to coordinate dietary recommendations with medical needs. Nutrition jobs in the community often involve working in public health clinics, cooperative extension offices, and HMOs to prevent disease and promote the health of the local community. Nutrition jobs in the nonprofit world involve anti-hunger organizations, public health organizations, and activist groups.

Nutritionists and dietitians can also find work in the private sector. Increased public awareness of food, diet, and nutrition has led to employment opportunities in advertising, marketing, and food manufacturing. Dietitians working in these areas analyze foods, prepare marketing materials, or report on issues such as the impact of vitamins and herbal supplements. Consultant careers can include working in wellness programs, supermarkets, physicians' offices, gyms, and weight-loss clinics. Consultants in private practice perform nutrition screenings for clients and use their findings to provide guidance on diet-related issues, such as weight reduction. Nutrition careers in the corporate world include designing wellness strategies and nutrition components for companies, working as representatives for food or supplement companies, designing marketing and educational campaigns, and becoming lobbyists. Others in the private sector work in food-service management at health-care facilities or at company and school cafeterias. Sustainable agricultural practices are also providing interesting private sector careers on farms and in food systems. There are employment opportunities in farm management, marketing and sales, compliance, finance, and land surveying and appraisal.

Working toward Tomorrow

Whether you pursue nutrition as a career or simply work to improve your own dietary choices, what you have learned in this course can provide a solid foundation for the future. Remember, your ability to wake up, to think clearly, communicate, hope, dream, go to school, gain knowledge, and earn a living are totally dependent upon one factor—your health. Good health allows you to function normally and work hard to pursue your goals. Yet, achieving optimal health cannot be underestimated. It is a complex process, involving multiple dimensions of wellness, along with your physical or medical reality. The knowledge you have now acquired is

also key. However, it is not enough to pass this nutrition class with good grades. Nutrition knowledge must be applied to make a difference in your life, throughout your life.

Throughout this textbook, we have focused on the different aspects of nutrition science, which helps to optimize health and prevent disease. Scientific evidence provides the basis for dietary guidelines and recommendations. In addition, researchers in the field of nutrition work to advance our knowledge of food production and distribution. Nutrition science also examines the ill effects of malnutrition and food insecurity. The findings that are uncovered today will influence not only what we eat, but how we grow it, distribute it, prepare it, and even enjoy it tomorrow.

References

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