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FOOD FIGHT

Challenging the USDA Food Pyramid, 1991

David E. Henderson and Susan K. Henderson

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Reacting Consortium Press Open Access Games

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Overview of the Game

This game is set in a 1991 hearing by the House Agriculture Subcommittee of the Committee on Government Operations that examined the decisions by the United States Department of Agriculture (USDA) surrounding the Food Pyramid. The USDA had developed the material, made it public, then withdrew it under political pressure for additional study, and finally released essentially the same material a year later. Congress wants to know whether the USDA has developed a scientifically valid recommendation on diet and to what extent political considerations were involved in the process.

There are two important intellectual ideas in this game, one scientific and one political. The scientific issue is encapsulated in the "eat more–eat less" controversy that is at the heart of the food pyramid debate. The game occurs during a period when the role of diet in health was being transformed by new research. The USDA, which had historically dealt primarily with malnutrition, was suddenly faced with evidence that certain foods could either cause or prevent serious illness. What should be the role of fat in the diet? Should we eat less fat, more fat, or only certain kinds of fat? How much meat is needed for optimal health? Do adults need to drink milk? Should people eat more fresh vegetables and fruits?

The second issue has to do with the regulatory structure of the US government and whether a single agency can serve multiple, conflicting roles. In this case, the USDA has three different roles. It is charged with promotion of all agriculture in the United States, with particular emphasis on the meat and dairy industries. It also regulates most meat and most dairy products to ensure safety. Finally, it is charged with educating the public about how much of these foods should be eaten for good health. This creates a conflict when research suggests people should eat less of the foods that the USDA is charged with promoting.

Because the regulatory issues in the game are still very much in play today, this aspect of the game is directly relevant to public policy. Different aspects of food safety are covered by a number of different federal agencies. An example of this fragmentation is that frozen cheese pizza is regulated by the Food and Drug Administration while frozen pepperoni pizza is regulated by the USDA.

Prologue

The wheels of the 737 chirp on the pavement of the runway at Washington National Airport, and you find yourself back in DC. You love this city, but it is always nice to be away for a while. As you come into the airport, you see your assistant Sam waiting for you with a portfolio. Work begins. Sam leads you to the waiting Town Car, and the driver takes your bags.

As the car pulls onto the George Washington Parkway, you quickly read the documents Sam has brought. There are a few changes needed to your remarks for the hearings. You write them in the margins. The press release looks fine. Sam will have to do a little more work tonight to have your speech ready. Words matter in your business, and rewrites are the only way to get these things perfect. The hearings in Congress tomorrow are not really a big deal. It is just a subcommittee, but there are always politics going on and you didn't get where you are by ignoring the small details.

As you cross the Memorial Bridge, you are struck, as always, by the beauty of the Lincoln Memorial in the early evening twilight. This is a sight that never gets old. Turning onto Constitution Avenue, you remind the driver that he is to drop you at the Washington Sports Club instead of your room. You ask him to please take your bags to your room and then take the rest of the evening off. The weather is nice, and you will walk from the gym to dinner.

After changing at your locker, you enjoy the chance to work some of the kinks out of your body. The seats on airplanes don't really agree with you. Some weight work and then a jog on the treadmill leave you feeling much improved. On the way to your locker, you think about a massage and book one immediately. Finally, showered and dressed, you are looking forward to dinner at Old Ebbitt's Grill. The workout has made you ravenous, and you are already fantasizing about beef and a good bottle of wine.

When you arrive at Old Ebbitt's, the maître d' greets you as an old friend and leads you to your regular table. On the way, you pass the majority leader deep in conversation with a lobbyist from Archer Daniels Midland. ADM

must have an amendment they want added to the latest farm bill. More support for corn no doubt. Seeing them in deep conversation, you don't stop to say hello. At the next table is a group of lobbyists from the American Petroleum Institute with the Senate minority leader. They must be working on oil field licenses again. You wave and move on. As you get closer to your table, you see the rest of your party has already arrived, so you hurry on to greet them.

There is already a bottle of Dom Pérignon champagne and some cheese and bread on the table. Someone must be putting this on their expense account. That will certainly make the evening special, but it also means someone will want to talk shop. You apologize to Paul, Jane, and Richard for being late. That massage is responsible.

The conversation picks up again. You discover that Jane is discussing her problem with her son's weight. Jane just can't seem to keep him from gaining weight and really doesn't know what to do about it. He keeps needing larger clothes and is too heavy to participate in sports anymore. You suggest she pay attention to the hearings tomorrow to see whether the USDA has any suggestions other than the basic four food groups. You order a filet mignon and a glass of red wine and are surprised when Paul orders the broiled seafood platter with extra vegetables. Then you remember his heart attack last year. He must be eating on doctor's orders. He was always the one for pasta Alfredo with a side of heavy cream and cheesecake for dessert. Good for him. You hope this works. Paul is a good friend and a reliable colleague. You wonder if changing his diet this way can really make a difference. Paul says he is following something called the Pritikin plan, and that Dr. Pritikin claims great success with reversing cardiovascular disease using only diet. Richard seems unimpressed, but certainly wishes Paul good luck with it.

As much as you try to steer the conversation away from business, some is inevitable. Richard needs to put this on his expense account, especially after ordering a bottle of really expensive champagne. So you listen to his pitch and take the position paper on nutrition he gives you. You can read it to help you get to sleep tonight. You end the meal with espresso and some fruit. Paul and Richard start to argue over the need for meat in the diet and how many vegetables and fruits should be eaten each day. You noticed that Richard left his vegetables behind on his plate at dinner and wonder when his heart attack will come. As you are thinking this, Paul puts your thoughts into words, and Richard, maybe embarrassed a bit, excuses himself to leave. Fortunately, he pays the check first.

Soon you say goodnight to Jane and Paul, and you walk the few blocks to your room. The night air is refreshing after the heavy meal, and you are happy you decided to walk instead of taking a cab. Your suitcase is in your room and has been unpacked. Good old Sam, always the efficient one. There is also a pile of papers on your desk that Sam left for you, homework for tomorrow. The downside of a good assistant is they never let you get too far from work. You can't ever go into a hearing without doing the background research. Nothing is more embarrassing than being unprepared. You don't want to let your colleagues and supporters down.

You settle into the chair with the briefing books and read all about food pyramids. You think about all the lobbyists and constant bickering between the members of the cabinet. Drifting off to sleep later, you imagine a pyramid of food and wonder what should be on the top, the best foods or the worst?

How to Play This Game

This is a "reacting" game. Reacting games use complex role-playing to teach about moments in history. Students are given elaborate game books that place them in moments of historical controversy and intellectual ferment. The class becomes a public body of some sort; students, in role, become particular persons from the period, often as members of a faction. Their purpose is to advance a policy agenda and achieve their victory objectives. To do so, they will undertake research and write speeches and position papers; they will also give formal speeches, participate in informal debates and negotiations, and otherwise work to win the game. After a few preparatory lectures, the game begins and the players are in charge; the instructor serves as adviser or "Gamemaster" (GM). Outcomes sometimes differ from the actual history; a postmortem session at the end of the game sets the record straight.

The following is an outline of what you will encounter in reacting games and what you will be expected to do. While these elements are typical of every reacting game, it is important to remember that every game has its own special quirks.

1. Game Setup

Your instructor will spend some time before the beginning of the game helping you to understand the historical background. During the setup period, you will read several different kinds of material:

- The game book (from which you are reading now), which includes historical information, rules and elements of the game, and essential documents; and
- Your role sheet, which describes the historical person you will play in the game.

You may also be required to read primary and secondary sources outside the game book (perhaps including one or more accompanying books), which provide additional information and arguments for use during the game. Often you will be expected to conduct research to bolster your papers and speeches.

Read all of this contextual material and all of these documents and sources before the game begins. And just as important, go back and reread these materials throughout the game. A second reading while *in role* will deepen your understanding and alter your perspective: ideas take on a different aspect when seen through the eyes of a partisan actor.

Players who have carefully read the materials and who know the rules of the game will invariably do better than those who rely on general impressions and uncertain recollections.

2. Game Play

Once the game begins, certain players preside over the class sessions. These presiding officers may be elected or appointed. Your instructor then becomes the GM and takes a seat in the back of the room. Though not in control, the GM may do any of the following:

- Pass notes to spur players to action;
- Announce the effects of actions taken inside the game on outside parties (e.g., neighboring countries) or the effects of outside events on game actions (e.g., a declaration of war); and
- Interrupt and redirect proceedings that have gone off track.

Presiding officers may act in a partisan fashion, speaking in support of particular interests, but they must observe basic standards of fairness. As a fail-safe device, most reacting games employ the "Podium Rule," which allows a player who has not been recognized to approach the podium and wait for a chance to speak. Once at the podium, the player has the floor and must be heard.

In order to achieve your objectives, outlined in your role sheet, you must persuade others to support you. You must speak with others, because never

will a role contain all that you need to know, and never will one faction have the strength to prevail without allies. Collaboration and coalition building are at the heart of every game.

Most role descriptions contain secret information, which you are expected to guard. Exercise caution when discussing your role with others. You may be a member of a faction, which gives you allies who are generally safe and reliable, but even they may not always be in total agreement with you.

In games where factions are tight-knit groups with fixed objectives, finding a persuadable ally can be difficult. Fortunately, every game includes roles that are undecided (or "indeterminate") about certain issues. Everyone is predisposed on certain issues, but most players can be persuaded to support particular positions. Cultivating these players is in your interest. (By contrast, if you are assigned an "indeterminate" role, you will likely have considerable freedom to choose one or another side in the game; but often, indeterminates also have special interests of their own.)

Cultivate friends and supporters. Before you speak at the podium, arrange to have at least one supporter second your proposal, come to your defense, or admonish those in the body not paying attention. Feel free to ask the presiding officer to assist you, but appeal to the GM only as a last resort.

Immerse yourself in the game. Regard it as a way to escape imaginatively from your usual "self"—and your customary perspective as a college student in the 21st century. At first, this may cause discomfort because you may be advocating ideas that are incompatible with your own beliefs. You may also need to take actions which you would find reprehensible in real life. Remember that a reacting game is only a game and that you and the other players are merely playing roles. When they offer criticisms, they are not criticizing you as a person. Similarly, you must never criticize another *person* in the game. But you will likely be obliged to criticize their *persona*. (For example, never say, "Sally's argument is ridiculous." However, feel free to say, "Governor Winthrop's argument is ridiculous"—though you would do well to explain exactly why!) Always assume, when spoken to by a fellow player (whether in class or out of class), that that person is speaking to you in role.

Help to create this world by avoiding the colloquialisms and familiarities of today's college life. Never should the presiding officer, for example, open a session with the salutation, "Hi, guys." Similarly, remember that it is inappropriate to trade on out-of-class relationships when asking for support within the game. ("Hey, you can't vote against me. We're both on the tennis team!")

Reacting games seek to approximate the complexity of the past. Because some people in history were not who they seemed to be, so too, some roles in reacting games may include elements of conspiracy or deceit. (For example, Brutus did not announce to the Roman Senate his plans to assassinate Caesar.) If you are assigned such a role, you must make it clear to everyone that you are merely playing a role. If, however, you find yourself in a situation where you find your role and actions to be stressful or uncomfortable, tell the GM.

3. Game Requirements

Your instructor will explain the specific requirements for your class. In general, a reacting game will require you to perform several distinct but interrelated activities:

- **Reading:** This standard academic work is carried on more purposefully in a reacting course, since what you read is put to immediate use.
- **Research and Writing:** The exact writing requirements depend on your instructor, but in most cases, you will be writing to persuade others. Most of your writing will take the form of policy statements, but you might also write autobiographies, clandestine messages, newspapers, or after-game reflections. In most cases, papers are posted on the class website for examination by others. Basic rules: Do not use big fonts or large margins. Do not simply repeat your position as outlined in your role sheets: You must base your arguments on historical facts as well as ideas drawn from assigned texts—and from independent research. (Your instructor will outline the requirements for footnoting and attribution.) Be sure to consider the weaknesses in your argument and address them; if you do not, your opponents will.
- **Public Speaking and Debate:** Most players are expected to deliver at least one formal speech from the podium (the length of the game and the size of the class will affect the number of speeches). Reading papers aloud is seldom effective. Some instructors may insist that students instead speak freely from notes. After a speech, a lively and even raucous debate will likely ensue. Often the debates will culminate in a vote.
- **Strategizing:** Communication among students is a pervasive feature of reacting games. You should find yourself writing emails, texting, and attending meetings on a fairly regular basis. If you do not, you are being outmaneuvered by your opponents.

4. Skill Development

A recent Associated Press article on education and employment made the following observations:

> The world's top employers are pickier than ever. And they want to see more than good grades and the right degree. They want graduates with so-called soft skills—those who can work well in teams, write and speak with clarity, adapt quickly to changes in technology and business conditions, and interact with colleagues from different countries and cultures. . . . And companies are going to ever-greater lengths to identify the students who have the right mix of skills, by observing them in role-playing exercises to see how they handle pressure and get along with others . . . and [by] organizing contests that reveal how students solve problems and handle deadline pressure.

Reacting games, probably better than most elements of the curriculum, provide the opportunity for developing these "soft skills." This is because you will be practicing persuasive writing, public speaking, critical thinking, problem-solving, and collaboration. You will also need to adapt to changing circumstances and work under pressure.

This game deals with both science and issues of policy, ethics, and philosophy. The authors believe that every educated person needs to develop the ability to interpret the barrage of technical studies that are often cited but often misrepresented in the popular media. This is necessary if one is to make informed decisions on what to eat, how to deal with personal health, and how to vote on important issues of policy related to the environment.

PRIMARY AND SECONDARY SOURCES

Scientists usually publish their findings in technical journals written primarily for specialists. Few scientists fully understand material from outside their area of specialization. The material in these journals is usually *peer reviewed*. This means that other specialists have reviewed the work and believe it is reliable. The peer review process is not perfect and errors do occur, but peer-reviewed scientific publications are the gold standard for reliable scientific information. Articles from these journals are called primary sources because they are written by the researchers who did the actual work.

The problem faced by non-specialists, even those trained in science, is they often cannot read the research studies. Many research articles are summarized

by professional science writers who are generalists who read the primary literature and explain it to a wider audience of non-specialists. If one picks up a copy of *Science* or *Nature*, two of the most prestigious primary journals in the English language, the opening pages often select a few of the scientific reports and explain them for a wider audience. These reviews or summaries are produced by science writers. Similarly, *Science News* and *Discovery* are publications that review a wide range of primary sources and summarize them for an audience of non-specialists.

These summaries of primary sources are referred to as secondary sources, meaning they were not written by the people with direct knowledge of the work. Virtually all scientists depend on secondary literature outside their area of specialization. You don't expect a gastroenterologist to diagnose an ear infection, and a biologist probably won't really understand a paper on nuclear physics. So they depend on secondary literature.

INTERPRETING SCIENCE IN THE POPULAR MEDIA

The popular media are generally much less reliable than the secondary literature because the reporters who write for many media outlets have no real expertise as science writers. They take what they read in the secondary literature and try to make it interesting, or in some cases sensational, for their readers. The result of this is a steady stream of popular media reports that often appear to contradict what you read just days before. Caffeine is bad for you; no, it is good. Fat is bad; no, fat is good. Well, some kinds of fat.

Sadly, the popular media often pick up the results of small, preliminary studies and make gross generalizations about them. Be on the lookout for these studies. They may make good television, but they are not good science. These are the studies that are the most frustrating because they are often contradicted by another study within days.

Finally, the popular media are constantly manipulated by special interest groups. Energy companies spend millions of dollars highlighting every minor flaw in the science of climate change. The food industry sponsors studies and disseminates them through the popular media to encourage you to buy their products. Makers of medical products plant glowing reports on the latest wonder drug.

SCIENCE IN THIS GAME

This game includes references to primary sources. In some courses, instructors may ask you to read the primary sources themselves, but recognize that even science faculty may struggle with articles outside their general area of expertise. The good news is that most primary articles include an *abstract* that provides the basic conclusions of the study. Also, the *conclusions* toward the end of primary sources often contain what you really need to know. The material in the middle is often a collection of minute details that are essential for peer review, but these are unnecessary for your purposes in the game. Consequently, if you encounter difficult primary sources, make sure you look at the abstract and the conclusions.

The game book also includes *summaries* of some key primary sources. These were written by the game authors to provide easily accessible secondary source material. At first glance, these may contain technical material that will challenge you. They may also contain information that is unnecessary to making your argument. Even if you do not fully understand a summary, try to find information that can help you to support your argument. Graphs or tables of data may be particularly easy to access.

Finally, there are some questions you should ask about all technical reports. First, ask whether it is a primary source, a secondary source, or something from the popular media. In all cases, ask yourself whether the author has a vested interest in convincing you of something. If a university lab writes a report on climate change, you might ask where they got their research funding. If it came from Exxon Mobil, you may consider it differently than if it was funded by the Environmental Protection Agency. If it was funded by Greenpeace, that would give it a different spin as well. The same applies to health-related publications. Are they from a company selling a product or a research lab? Who paid for the study? Apply this level of critical thinking to all your sources of information. It is important to learn to read and extract what you need from a challenging document.

EPIDEMIOLOGY

For studies of diet and health, there is an additional level of complexity. In studies of humans, it is also useful to look at how large a group was studied, how they were selected, and whether the participants were selected before the study began (prospective study) or after (retrospective). Some studies are

also "studies of studies" called *meta-analysis*. These take data from a number of small studies and attempt to collect them together to construct a larger pool of people to get more reliable information.

The gold standard of studies involving people's health involves taking a large random group and dividing them into several groups that are exposed to different diets, treatments, etc. These are expensive and take a long time to complete. In many cases, they cannot be done ethically because they would expose people to risks.

A more common approach is to select people with a specific outcome (e.g., lung cancer, heart disease, etc.) and compare specific factors in their past that they remember with a similar group lacking the outcome. These are epidemiological studies and can never really prove anything. Their proper place in research is to identify questions for further study.

A less reliable type of epidemiological study is one in which an entire population is selected and average health, diet, or exposure data are used instead of looking at individuals. These are subject to even greater uncertainty. Epidemiological studies do often provide information that demands action. The fact that most lung cancer victims are smokers is an epidemiological result, and it didn't make sense for people to keep smoking until the results were definitive. Still, that is what the tobacco industry convinced millions of people to do.

The other way that health is studied is using animal models. Much of this work is done using mice and rats. They are not the kind of animals that get people really upset, and they are inexpensive to study. Their life spans are short, so they can be followed for multiple generations. The problem with using models is their biochemistry is not the same as that of humans. Rats can eat a lot of things that would make humans sick. Animal models produce many important discoveries, but again, the popular media like to pick up these stories and generalize them to people as facts. Again, skepticism is your primary protection.

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Timeline

Dietary advice from the US government has a long history. Professor Marion Nestle of New York University notes in her *History of Dietary Guidelines* that as early as the 1890s, work by William Atwater at the United States Department of Agriculture (USDA) produced recommendations that would fit well with the conclusions reached in 1991.[1] He recommended holding fat to about ⅓ of calories and getting at least ½ of daily calories from carbohydrates. These recommendations were ignored because the USDA's focus was more on ensuring everyone got adequate calories. The published recommendations of the USDA were also used to support the various farming groups that the Department of Agriculture was formed to promote, especially meat and dairy. Some of the recommendations published in the early 1900s include the suggestion that everyone eat a pound of sugar a week and fat from bacon and butter. In the 1940s, there was even a "Butter Group" in the food graphics produced by the USDA.

During the 1970s and 1980s an intense debate occurred within the USDA over its congressionally mandated effort to advise the public on what, and how much, to eat for good health. The USDA had long had a stance characterized as "eat more," with the goal of avoiding malnutrition. It was also responsible for regulating and promoting the dairy and meat industries. During the "eat more" period, these multiple roles caused little conflict.

During the 1970s, evidence began to accumulate that excess consumption of certain foods was a leading cause of major diseases, such as heart disease, cancer, and diabetes. The 1979 Senate McGovern Committee prepared a report that recommended reducing total dietary fat and especially saturated fat as a way to prevent cardiovascular disease. Their recommendations were far

1. See Marian Burros, "Plain Talk about Eating Right," *The New York Times*, October 6, 1991, Sunday, Section 6, Part 2, Page 10, Column 1, Magazine Desk.

reaching and included educational efforts for the general public and for medical professionals. They also recommended that the food industry produce products lower in total and saturated fat. Based on this directive from Congress, the nutritional experts within the USDA began to urge a position of "eat less" for items thought to lead to disease. This required a shift in the diet from red meat, fats, and sugar to more grains, legumes, fruits, and vegetables, which appeared to have health benefits beyond their caloric and vitamin content. This evidence was summarized in the publication of the Surgeon General's report in 1988. By this standard, Americans were consuming too many calories and too much of the wrong things.

The USDA began a multi-year effort to develop a new graphic to communicate the information in the Surgeon General's report to the American public. This culminated in 1991 with the attempt to release the Food Guide Pyramid.

Narrative of the Current Situation

The new graphic developed by the USDA, known as the "1991 Food Guide Pyramid," displayed a hierarchy of foods that would visually communicate the relative amounts of each group that made up a healthy diet. The pyramid is shown in Figure 1. The main thrust of the Surgeon General's report was that Americans should reduce their consumption of fat, especially saturated fat. The Surgeon General's report followed the *1980 Dietary Guidelines for Americans* released by a committee of the US Senate that concluded reducing fat would reduce the incidence of cardiovascular diseases and cancer.

The pyramid graphic included specific recommendations for number of servings and the serving size of each. The pyramid expanded the number of food groups from the Basic Four (meat, dairy, grains, and fruits and vegetables) to seven. A number of visual presentations were considered by the USDA in the development of the Food Pyramid. The details of the options considered are found in Welsh (Welsh et al., "Development of the Food Guide Pyramid," *Nutrition Today*, pp. 12–23, 1992), summarized with examples in the chapter "Core Texts."

The process of developing the graphic was a multi-year effort involving a large number of experts. They considered the science of the recommended diet, meeting their goal to help Americans reduce their consumption of fat, and lastly increasing certain nutrients that were deficient. The pyramid was tested in a variety of focus groups, and the USDA considered a number of

Figure 1. USDA Food Guide Pyramid

different graphics. You should examine these in "Core Texts" as you prepare for the game since they will be the focus of part of the debate.

Food Pyramid relegated the meat and dairy groups to smaller portions of the graphic than the old Basic Four. This made the meat and dairy interests very upset. The pyramid made it appear that USDA scientists were recommending limitations on the consumption of meat and dairy for the first time. However, it is not clear that the actual language used was a significant change from past recommendations. Overall, the recommendations for meat and dairy had long been considered a serious conflict with the USDA's mandate to regulate and support the dairy and meat industries. Some nutritionists felt that beans and nuts were adequate substitutes for meat and that the recommendation should be for protein-rich foods rather than specifically for meat.

The stage was set for an epic battle, and no one should have been surprised that it occurred. What made this particular battle so interesting was the fact that virtually every aspect of the internal discussion, lobbying activity by the meat and dairy interests, and the actions of the political appointees at the USDA became public during the debate. This public record, in newspapers and magazines, provides an important resource for the game. The article by Marion Nestle "The Politics of Dietary Guidance" (*American Journal of Public*

Health, p. 713, 1994) and her book *Food Politics: How the Food Industry Influences Politics* revealed the political aspects of the debate and were widely reported in the press.

The drama reached a fever pitch in April 1991. The USDA staff had completed the pyramid and presented it to over 20 national meetings of nutritionists, textbook publishers, and everyone else they could get to listen. They were ready to release a million copies of the food guide, but in March, a new Secretary of Agriculture, Edward Madigan, was appointed. He learned of the Food Pyramid through a *New York Times* article reporting on an effort by the Physicians Committee for Responsible Medicine to have the USDA develop guidelines with a vegetarian selection of foods. While the USDA had never considered this recommendation, the newspaper report appeared on the weekend before the meeting of the National Cattlemen's Association in Washington, DC. A former USDA Secretary, John Block, now representing pork producers also saw this report. The publicity immediately got the attention of the meat and dairy industry, and they began to apply intense pressure to have the pyramid graphic withdrawn.

The new Secretary of Agriculture, bowing to this pressure, withdrew the graphic for "further study." His public rationale for this was that the graphic might be confusing for children and low-income people. The pyramid graphic was actually designed for adults with a 12th-grade education, and the USDA staff had never considered that it would be used for children. The USDA staff were unhappy with the decision as noted by a statement published in a *New York Times* article about the decision.

> Gerald Combs, who retired last Friday from the department (USDA) as deputy administrator for human nutrition, said: "For almost eight years, until this release came out, I had had no surprises and no pressures. Issues were dealt with on the basis of scientific fact and objectivity. I was terribly upset by this announcement. I don't know of any valid reason for the decision made so abruptly and handled so badly. One can only jump to all sorts of conclusions. My concern is that people will think the department has no integrity or objectivity."[2]

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2. Marian Burros, "Are Cattlemen Now Guarding the Henhouse?" *The New York Times*, May 8, 1991, Section C, Page 1, Column 1, Living Desk.

Congress wanted to know what was going on and whether the pyramid represented sound nutritional advice. The game sessions consist of a hearing by the US House Agriculture Subcommittee of the Committee on Government Operations held in 1991 to examine the USDA's recent decision to withdraw the Food Pyramid. It may also consider the possibility of moving authority for nutritional guidelines to the Department of Health and Human Services (DHHS). Hearings will examine all aspects of the recommendations and the actions of the Secretary of Agriculture.

The Congressional Committee will need to be convinced by the USDA, as well as medical and nutritional scientists that the science behind their recommendations is sound. You and your classmates represent five factions: (1) congressional representatives, (2) representatives from the USDA, (3) representatives from DHHS and other organizations that are involved in health, (4) representatives from agricultural industries, including meat and dairy, and (5) journalists. You will research your role and will write and present your position with respect to the pyramid. Read your role sheets carefully, and remember to form arguments that are consistent with your role. You will be given specific victory objectives that will determine whether you win or lose.

Your victory objectives are directly related to the votes of the congressional representatives, and you will want to convince them of the soundness of your position.

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Issues to Debate

The congressional representatives will vote on these two issues:

1. Should the newly revised pyramid be accepted or rejected by the committee?
2. Should the USDA maintain responsibility for issuing nutritional guidelines, or should that responsibility be transferred to DHHS?

The debate on whether to accept the pyramid will form the major focus of the debate. Questions include whether the scientific basis of the pyramid is sound in terms of dietary recommendations and whether the pyramid is the best way to present this information. Some may also raise the possibility that the pyramid may be based more on political considerations and the role of the USDA to promote the meat, corn, and dairy industries than on sound nutritional science. Such accusations would need to be based on scientific evidence that challenges the dietary recommendations in the pyramid.

Rules and Procedures

You will be assigned a role as one of the people involved in these hearings. Your job is to research the Food Pyramid from the point of view of your role. Is the pyramid good or bad for your goals? You will develop an argument to present at the hearings to support your position. You should base this argument on as much scientific evidence as possible and be prepared to defend your position against probing questions from the other players in the game.

The hearings that form this game will be moderated by the Chair or Vice-Chair of the Agriculture Subcommittee of the Committee on Government Operations (Congressional Committee) of the US House of Representatives.

The hearings will begin with very brief introductions, and then representatives from the USDA will present their findings and rationale for the pyramid. The floor will be open to questions and comments by representatives from governmental organizations (GOs) and non-governmental organizations (NGOs) as well as members from food producers and their lobbyists.

You will be part of a faction that will work together to plan strategy. You can simplify your work if you coordinate your arguments so that you don't all try to argue all of the points you need to make. Divide the work, and coordinate your arguments. There will be brief faction meetings during the game, but you are expected to meet outside of class or communicate electronically with your faction to plan strategy and help each other find the evidence needed.

How to Win: Objectives and Victory Conditions

Each role includes specific objectives that will lead to victory. Congressional representatives' primary goal is reelection, while all other roles have objectives that depend on the outcome of the decision made by the congressional representatives. They are the only players who are indeterminate and who need to be convinced. Whether the congressional representatives are reelected depends on a dice role and other factors that may increase or decrease their chances. These include public opinion of their work and their ability to mount a successful campaign.

Structure of Game Sessions

There are various ways that the game sessions can be arranged. The Committee Chair has considerable latitude in how the actual order of presentations will occur. The Chair of the Committee of Congressional Representatives can allow alternate speakers from each faction if that seems desirable. If her sense is that questions being asked will be covered by subsequent speakers from a faction, she may allow multiple speakers from the USDA faction before others are allowed to make formal presentations. After the initial presentation by the USDA, major presentations should rotate among the factions at the discretion of the Chair.

Basic Outline of the Game

The Chair or Vice-Chair will begin by stating the reason for convening the group. It should be made clear that the congressional representatives have

been asked to make a recommendation regarding the newly developed Food Pyramid and the role of the USDA in its responsibility for setting nutritional guidelines. The congressional representatives are seeking arguments either in favor of or against the Food Pyramid to help them decide how to vote.

After the opening statements by the Chair, each congressional representative may be allowed 1–2 minutes to briefly state their concerns and interests related to the Food Pyramid from the perspective of the state they represent.

Following the opening statements, the faction representing the USDA will present the pyramid, the reasons for the changes that were made, and why the newly revised Food Pyramid is an improvement over the past guidelines.

At this point, Factions 2, 3, and 4 should be heard in alternation. They will present their position with regard to the adoption of the Food Pyramid. The arguments should be addressed to the congressional representatives. **Direct debates with the USDA faction should be avoided, though the USDA faction should be allowed to answer questions.**

At the end of the first session, the journalists will briefly meet and vote on the issues before the committee. If possible, they will seek to find consensus, but each journalist is free to write the conclusions they have reached from the evidence presented.

For each subsequent session, the Chair or Vice-Chair will call the meeting to order and may make a brief statement and ask if other congressional representatives have any questions or statements before the floor is opened for further questions or comments.

At the beginning of the final game session, the journalists will each present the results of their investigative reporting. These will be posted prior to the session and the journalists will summarize their findings. The committee may choose to question any or all of the journalists at their discretion.

At least 15–20 minutes before the end of the final class session, the Chair or Vice-Chair will close the meeting. At this point, the congressional representatives will excuse themselves and go to a separate room or nearby hallway to vote. The vote is taken in private to avoid peer pressure from the class. Voting at the end of the final session is done by the members of Faction 1 only. **The Chair votes only in case of a tie.**

The congressional representatives will vote on these two issues:

ISSUE #1: Should the pyramid be accepted or rejected by the committee?
ISSUE #2: Should the USDA maintain responsibility for issuing

nutritional guidelines, or should that responsibility be transferred to DHHS?

After the vote is taken, the congressional representatives will enter the room and announce the results of the vote.

After the results of the vote are announced, each congressional representative roles a die to determine whether they are reelected. Role sheets for each congressional representative contain the secret significance of each die roll.

Two (75-minute) or three (50-minute) game sessions are normally required depending on the size of the class. Faction 1 should meet during the setup phase to elect a Chair and Vice-Chair. The Chair or Vice-Chair will run the game sessions.

Assignments

A quiz may be given at the end of the setup sessions and before the game begins.

Each student in Factions 2–4 will be expected to prepare a written document in which they summarize the arguments they will make in their oral presentations. The exact format of these documents will be defined by the professor before the beginning of the game. These papers are normally due (and publicly posted) before the first game session.

Journalists will observe the hearings and are expected to interview participants in the game in order to prepare an investigative journalistic work. These works will normally be papers, but the instructor may allow other media formats available in 1991. These are due and should be posted before the start of the final game session.

Congressional representatives write papers after the end of the game to explain the basis for their decisions. These papers should provide specific references to the arguments and individuals who made them during the game. The papers should not be just a general discussion without references.

Counterfactuals

The *Congressional Record* does not record what actually occurred at the hearings that form the basis of the game. There is also no record of who actually participated. However, there are numerous newspaper accounts of the

hearings, and the hearings are discussed in detail in *Food Politics* by Marion Nestle. These accounts form the basis for the construction of the game. Every effort was made to identify individuals who might have been involved and to obtain biographical information on them. However, not all of the characters in the game may have participated. The positions of the congressional representatives in the game are not necessarily accurate representations of their actual positions on the issues.

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Not all characters will be present in your game, but each faction will be represented.

Faction 1: Congressional Representatives

The representatives will listen to the witnesses and question them. Then they will vote on whether to accept the pyramid and which agency should provide nutritional education.

1. Representative from California
2. Representative from Texas
3. Representative from Wisconsin
4. Representative from Ohio
5. Representative from Florida
6. Representative from New Hampshire
7. Representative from Massachusetts
8. Representative from Vermont
9. Representative from West Virginia

Faction 2: United States Department of Agriculture Representatives

This faction includes the United States Department of Agriculture (USDA) staff and their hired consultants. They will make the case that the pyramid is the best way to educate the public on nutrition and the USDA is the best agency of the government to conduct research and education.

1. Edward Madigan, Secretary of Agriculture, responsible for the decision to stop publication and distribution of the newly revised pyramid
2. Steve Abrams, Deputy Assistant Secretary for Food and Consumer Services
3. Associate Professor of Nutrition at Penn State University
4. Assistant Secretary of Agriculture for Food and Consumer Service
5. Health Communications Consultant and advisor for the USDA report
6. Project Officer in the Office of Analysis, Nutrition and Evaluation

Faction 3: Government Health Agencies and NGOs

This faction opposes the USDA for a variety of reasons, some based on science, some based on politics. Their role is to cast doubt on the USDA's position by bringing the science of nutrition as known in 1991 to the forefront.

1. Louis W. Sullivan, Secretary of Health and Human Services (DHHS)
2. John Vanderveen, FDA Director of the Center for Food Safety and Applied Nutrition (CFSAN)
3. William L. Roper, MD, MPH, Director of the Centers for Disease Control and Prevention (CDC)
4. Bonnie Liebman, Head of the Center for Science in the Public Interest (CSPI), a Washington-based consumer advocacy group
5. Dr. Rachel Ballard-Barbash, Medical Officer in the division of cancer prevention and control at the National Cancer Institute
6. Philip A. Wolf, M.D, Principal Investigator of the Framingham Heart Study

Faction 4: Food Production Supporters and Their Lobbyists

This faction will work to influence the congressional representatives. While they may provide testimony in the hearings, they will also work behind the scenes to influence the decision of the congressional representatives.

1. President of the National Cattlemen's Association
2. National Milk Producers Federation
3. National Corn Growers Association

4. Chief Lobbyist for the National Cattlemen's Association
5. Chief Lobbyist for the National Corn Growers Association

Faction 5: Journalists

Journalists will not only observe the hearings but also interview people behind the scenes. They will shape public opinion through their writings. The congressional representatives will need to pay attention to what they say. They will also look for those special bits of information that might win them a Pulitzer Prize if revealed.

1. Reporter for *Time Magazine*
2. Laura Shapiro, *Newsweek,* Journalist and Writer on Culinary History
3. Marian Burros, *New York Times,* Eating Well Columnist
4. Carole Sugarman, *The Washington Post,* Staff Writer
5. Candy Sagon, *The Washington Post,* Staff Writer

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1. McGinnis, J.M., and M. Nestle, "The Surgeon General's Report on Nutrition and Health: Policy Implications and Implementation Strategies," *American Journal of Clinical Nutrition,* 49:23–28, 1989.
2. Welsh, S., C. Davis, and A. Shaw, "Development of the Food Guide Pyramid," *Nutrition Today,* pp. 12–23, 1992, http://journals.lww.com/nutritiontodayonline/abstract/1992/11000/development_of_the_food_guide_pyramid.5.aspx.

Summary of McGinnis and Nestle

McGinnis, J.M., and M. Nestle, "The Surgeon General's Report on Nutrition and Health: Policy Implications and Implementation Strategies," *American Journal of Clinical Nutrition*, 49:23–28, 1989

The Surgeon General's Report on Nutrition and Health[3] is a summary of the current science relating diet and disease. The main recommendation is that a reduction in dietary fat will reduce chronic diseases. The specific recommendations identify both general recommendations and those for specific groups. The report concludes that action is needed at all levels of government, from the federal level to the local level, to achieve the goals of improved diet for the general population.

The dietary advice provided by the US government has evolved over the years. Table 1 summarizes these changes. Virtually all recommendations beginning with the 1980 US Senate report *Dietary Guidelines for Americans* include the goal of maintaining ideal body weight. Note also the shift from foods

3. Office of Disease Prevention and Health Promotion, Public Health Service, Department of Health and Human Services, Washington, DC.

Table 1. Summary of US Government Dietary Recommendations (adapted from source)

Year	Agency	Title	Include Starch and Fiber	Sugar	Fat	Cholesterol	Salt	Alcohol
1917	USDA	Five Food Groups	yes	include	include			
1942	USDA	Daily 8 Food for Freedom	yes		include			
1943	USDA	Basic 7 Wartime Nutrition	yes		include			
1946	USDA	Basic 4	yes		include			
1977	US Senate	Dietary Goals for the US	yes	limit	limit	limit	limit	
1980	DHHS-USDA	Dietary Guidelines for Americans	yes	limit	limit	limit	limit	limit
1984	DHHS-USDA	Recommendations for Control of High Blood Pressure			limit		limit	limit
1985	DHHS-USDA	Dietary Guidelines for Americans, 2nd ed.	yes	limit	limit	limit	limit	limit
1986	DHHS-NCI	Cancer Control Nutrition Objectives	yes		limit			limit
1988	DHHS	Surgeon General's Report on Nutrition and Health	yes	limit	limit	limit	limit	limit

to include to foods to limit in 1980, representing the shift from a focus on malnutrition and deficiencies in nutrients to one of using diet to promote health and prevent diseases through balancing nutrients and preventing overconsumption of some. The early recommendations were designed to encourage eating a varied diet and hence the recommendation to eat something from each of the 4–8 food groups. No effort was made to distinguish foods by fat content. In fact, during the 1940s the food recommendations included a butter group and the recommendation to get butter or margarine every day. Nowhere in the recommendations was there any limit placed on quantity, and nothing was said about body weight.

By the end of the 1970s, scientists had concluded that many chronic diseases, including cancer, coronary heart disease, stroke, atherosclerosis, and diabetes, were directly linked to the fact that the American diet contained too much fat, calories, salt, and alcohol and not enough fiber. Three other major causes—suicide, motor vehicle accidents, and liver disease—were associated with drinking too much alcohol. These eight diseases are responsible for 1.3 million of the 2 million annual deaths in the US.

Equally significant were non-fatal diseases that cause suffering and large costs for treatment. Sixty million people have high blood pressure, which contributes to 1.25 million heart attacks and 2 million strokes. Many people with heart attacks and strokes become disabled, placing further financial burdens on society and causing personal suffering. Nine hundred thousand new cases of cancer are diagnosed each year, and about half that number die each year from cancer. The overall costs of heart disease to the US economy in direct and indirect costs were estimated as $49 billion in 1985. Cancer costs added $72 million.

While there are many factors involved in each of the diseases mentioned above, diet is certainly one factor, and even a small reduction in risk would significantly improve health and reduce costs.

Of the various factors in the diet, the Surgeon General's report places the greatest emphasis on reducing fats and controlling calories. These two actions are believed to reduce risk for the five major diseases: heart disease, cancer, stroke, diabetes, and gastrointestinal (GI) disease. Increasing starch and fiber by adding fruits, vegetables, and whole grains is thought to reduce risk of cancer, diabetes, and GI disease. Reducing sodium would reduce heart disease and stroke. Reducing alcohol would reduce risk of cancer, stroke, and GI disease.

HOW THE SURGEON GENERAL'S REPORT WAS PREPARED

Developing the report required four years of work by more than 200 scientists. The primary responsibility for the report was within the Public Health Service (PHS), but 14 of the 19 chapters were written by centers within the National Institutes of Health. The primary focus was to compile and assess the research findings on the relation of diet to disease and then determine how these could be communicated and implemented. The final report had undergone three stages of review by the PHS and then three additional stages by independent scientists and professionals outside the government. Finally, the entire report was vetted, line by line, by PHS agency representatives until consensus was reached.

CONCLUSIONS OF THE REPORT

The report led to four main recommendations:

- Better diet would improve the health of many people in the US.
- The risk of chronic diseases is increased by excessive consumption of some foods.
- The highest priority is to decrease consumption of all fat and saturated fat.
- These recommendations apply to most chronic diseases related to diet.

The Surgeon General's dietary recommendations are listed below:

1. Fat and cholesterol in the diet should be reduced by adding low-fat foods such as fruits, vegetables, whole grains, fish, poultry, lean mean, and low-fat dairy.
2. It is important to keep a healthy body weight through controlling total calories eaten and through regular physical activity.
3. Increase whole grains, vegetables, fruits, and dried beans in the diet to get more complex carbohydrates.
4. Limit the amount of sodium in the diet.
5. Drink alcohol only in moderation (two drinks per day or fewer for men) and avoid drinking during pregnancy. Do not drink when driving or operating machinery.

Additional recommendations for selected groups are:

1. Use fluoride to prevent tooth decay, either in drinking water or as supplements or treatments.
2. People at risk for tooth decay should limit consumption of sugar.
3. Women and girls over 12 should increase the amount of high-calcium food, including low-fat dairy, in their diet.
4. Sufficient iron should be included in the diet of children, adolescents, and women up to age 45.

In general, these goals can all be accomplished by increasing consumption of fruits, vegetables, dry beans, whole grains, lean meat, poultry, fish, and low-fat dairy.

The recommendations are based on the understanding that there is no doubt that poor diet is responsible for some of the health problems in the American population. The National Policy Board of the Department of Health and Human Services (DHHS) has begun to develop specific targets for fat, fiber, and other components of diet. It has also begun a study of which groups are most at risk of nutritionally related diseases, specifically low-income groups. DHHS agencies in all areas will work to find ways to communicate the recommendations to the public through a variety of programs, including menus and food labels. DHHS will also work with the USDA to update its dietary guidelines and food assistance programs.

In addition to efforts by the government to monitor Americans' nutrition and focus research on diet and health, the public sector will be involved. Food industries will be encouraged to develop products that comply with the recommendations. DHHS will also support efforts of a large number of private organizations to mount national campaigns to raise awareness of the importance of reducing dietary fat.

Dietary choices are influenced by a culture that includes food advertising, advice from experts, publication of new research results, and the food available to the individual. In order to improve individual choices, the overall culture of food must be brought into alignment with the recommendations of the Surgeon General's report so that the overall health of the nation will improve.

Summary of Welsh et al.

Welsh, S., C. Davis, and A. Shaw. "Development of the Food Guide Pyramid," *Nutrition Today*, pp. 12–23, 1992

The summary below of the development of the Food Guide Pyramid is based on the material in this article.

Prior to 1970, food guides developed by the USDA were an attempt to use the growing scientific understanding of nutrition to help people get the nutrients they needed and avoid malnutrition. This all changed in 1977 with the publication of "Dietary Goals for the United States" by a committee of the US Senate. This shifted the focus from obtaining enough food to now avoiding eating too much of some foods, especially foods high in fat and saturated fat. By 1980, the responsibility for publishing dietary guidelines was shared by the USDA and the DHHS.

The development of the Food Guide Pyramid began in the early 1980s. The new food guide was intended to help healthy Americans make healthy food choices. The existing Basic Four plan was considered to be out of date with current research on the need to limit some foods. There was also a desire for a new graphic to get people's attention. The new guide should cover all aspects of diet, including the need to have enough vitamins and minerals but to avoid too much of the foods thought to cause chronic diseases. The new design also needed to group foods in a familiar way that would not change the way groups were traditionally constructed. Consumers should not need to unlearn things they were familiar with. The nutritional content assigned to the food groups should be based on the foods in the group that were common in the American diet to ensure the food groups accurately reflected what people would eat. The design should allow people flexibility in the way they met the requirements rather than requiring specific foods and amounts to meet nutritional needs. And finally, the guide should retain parts of previous guides that worked well and anticipate changes in the future so that it could evolve over time as new scientific studies reveal new information.

The research to establish the actual nutritional needs for the new guide was a three-year process. The research was shared with the nutrition professionals through peer review and pilot testing with consumers and finally unveiled for nutritionists by the USDA in 1985 and in a journal article published in 1987.

The process of developing the food guide began with the Recommended Daily Allowances for each category of nutrient determined by the National

Academy of Sciences. The recommendations in *Dietary Guidelines for Americans* were also considered for fat and added sugar.

The actual American diet was studied to determine how closely it matched the scientific recommendations. This information was then used to adjust the recommendations in the food groups to try to increase intake of nutrients for which Americans were typically deficient and reduce foods containing fat, which was being consumed in quantities much greater than the recommended amount. Some nutrients, such as fiber, didn't have specific recommended amounts, and some foods lacked good data on nutrient content. The uncertainties were dealt with by trying to ensure a wide variety of foods in each group.

The new food groups made two important changes from previous ones. First, they selected foods high in fat, sugar, and alcohol and singled them out as foods that should be used sparingly. Second, the bread group was clarified in an effort to encourage more whole grains.

Serving sizes were determined by looking at a number of factors. The typical amount eaten was considered, along with the units of measurement in common use. The nutrient content was also considered so that if one substituted one source of calcium or protein for another, the content of the serving would be the same. Thus, a serving in the milk group would have the same calcium content as a cup of milk and a serving of meat would have the same protein content, whether it came from meat or dry beans. Efforts were made to use traditional serving sizes as much as possible to avoid confusion.

Next, the nutrient profiles of the various food groups were determined using the most commonly eaten foods in the group. The profiles were also developed using the lowest fat and added sugar possibilities in the group. The fats and sugars added in cooking were not included, and the authors realized that consumers would certainly get more fat and sugar than the minimums in their calculations.

Once the serving sizes were determined, the number of servings for each food group were determined for different age and activity groups using the Recommended Daily Allowances. The guide was designed for the foods commonly eaten and did not take into account all possible eating patterns. Finally, the foods that needed to be eaten in moderation—fats and sugars—as well as the various caloric needs of people were considered. The serving recommendations were manipulated to keep total dietary fat below 30%. Dietary cholesterol and salt were also considered. The final patterns of servings for

Table 2. Dietary Recommendations by USDA

Food Group	Low Calorie 1,600 Calories/ Day	Medium Calorie 2,300 Calories/Day	High Calorie 2,800 Calories/ Day
Bread Group (oz)	6	9	11
Vegetable Group (cup)	3	4	5
Fruit Group (cup)	2	3	4
Milk Group (cup)	2–3	2–3	2–3
Meat Group (oz)	5	6	7
Fat (g)	53	73	93
Added Sugar (tsp.)	6	12	18

people who have low, medium, and high caloric needs based on activity levels are summarized in Table 2.

The new recommendations were distributed to the nutritional community in a variety of ways but failed to have much impact on the general public. To gain more visibility, a search was begun for a new visual way to explain the recommendations. The USDA hired the firm of Peter Novelli to develop a guide and graphic for adults with a 12th-grade education who did not have major financial constraints on their food choices. The consultants used focus groups with adults from ages 21–55. They also noted the constant barrage of media that led them to divide foods into good foods and bad foods. In addition, it was noted that women and men had different perceptions of the quantities and relative proportions of food involved.

Several graphics were evaluated by the focus groups. These included two pyramids, one of which is inverted; a wheel; and a wheel of blocks. These designs are shown in Figures 2–5.

Designs using a circle did not appeal to the focus group participants for various reasons. The pyramid designs were received positively and participants suggested putting pictures of the foods in the groups. The pyramid allowed the relative proportions of various foods in the diet to be shown graphically.

Based on the first round of focus groups, a food guide based on the pyramid was developed and tested on five new focus groups. This time, the focus groups were divided into three age groups. The pyramid design was popular with these groups as well. They felt it conveyed proportionality, though the

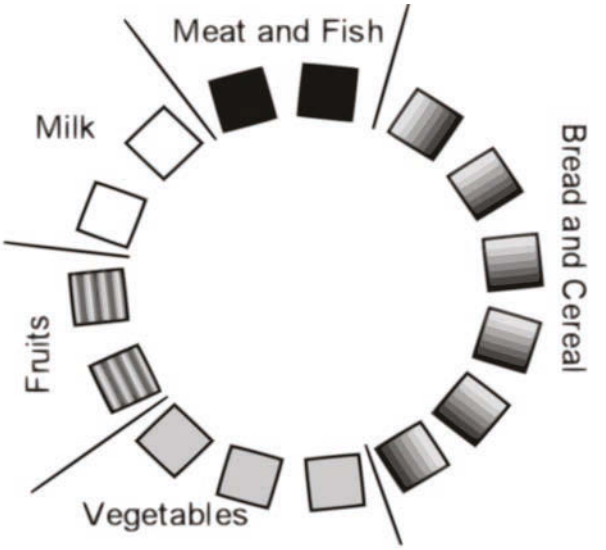

Figure 2. Food Wheel

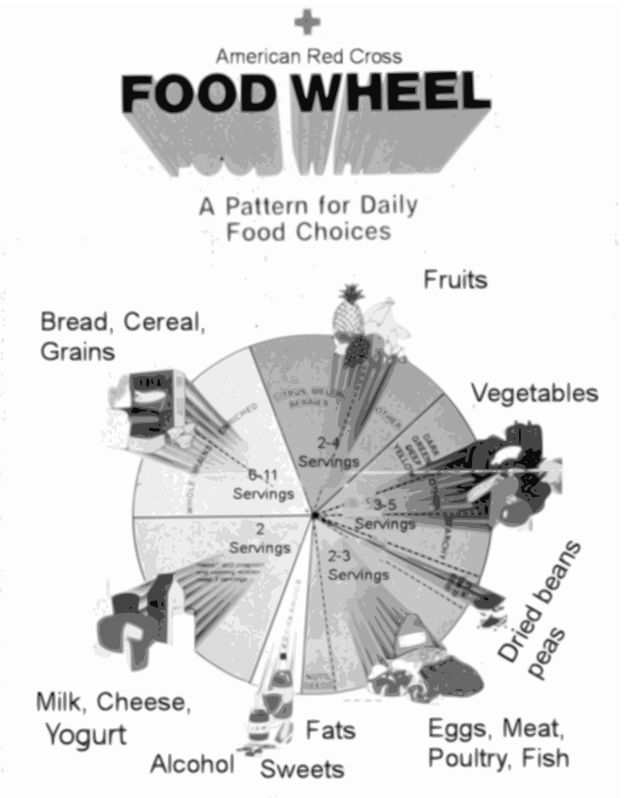

Figure 3. American Red Cross Food Wheel

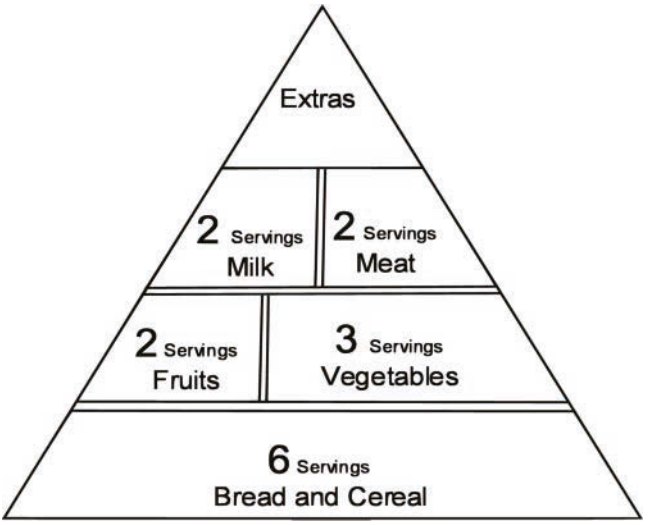

Figure 4. Upright Food Pyrami

design included some fats and sweets with efforts to promote moderation in this food group. The different sizes of the food groups appeared to help people remember how many servings of each they should eat.

There was considerable debate in the focus groups over how to best represent the fat and added sugar at the tip of the pyramid. The choices were to use symbols, pictures, or both. Finally, the decision was made to use only symbols for this group. One reason for this was that there is a lot of fat and sugar added to foods. The symbols were thought to make the point that all the fat and sugar mattered, not just the fat and sugar in specific foods.

In a test of the graphic with women aged 30–75, the majority understood the concept of proportionality and about a quarter of the group understood the idea that the pyramid was designed to promote healthy eating. Over 80% said they didn't feel the graphic was confusing; however, only 25% appeared to understand the meaning of the fat and sugar symbols. The text that accompanied the graphic was found to clarify the meaning and it was decided that both the graphic and text should be used together.

The final product was extensively reviewed by a wide range of nutrition experts and educators. However, before it was officially released in 1991, the newly appointed Secretary of Agriculture, Edward Madigan, required it be tested on children and others most at risk for nutritional deficiency due to low income or lack of education.

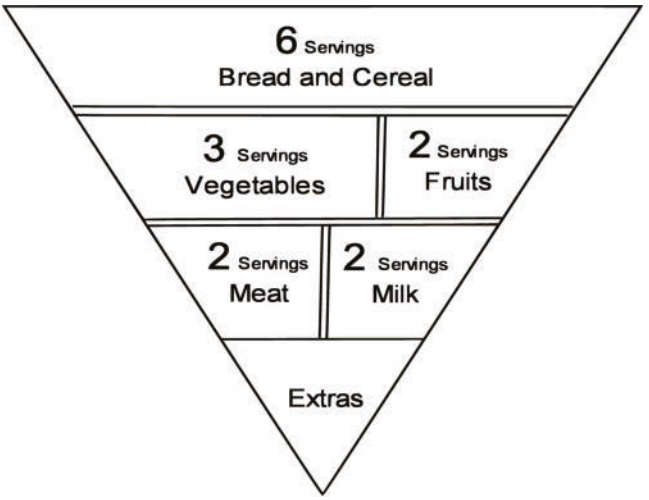

Figure 5.
Inverted Food
Pyramid

The USDA and DHHS hired Bell Associates to examine alternatives to the pyramid. The goals were to ensure that the final graphic would be understood by children and not convey incorrect ideas. Focus groups included children of various ethnic and economic groups from ages 5–11. Adults enrolled in food stamps and other federal food programs were also included in order for Bell Associates to evaluate the graphics for low-income groups from various parts of the US. Secondary teachers and other educators also participated in focus groups and interviews.

Over 400 different graphics were considered. Most were eliminated due to lack of appeal or difficulty in accurately representing the information. Circles of different sizes and pie chart diagrams were popular with the food industry because they didn't place any one food group above another, but they didn't work well with children (Figs. 6 and 7).

Grocery cart graphics were considered in the hope they would not be connected with a single meal (Fig. 8). However, many people had negative feelings about grocery shopping. Children also did not relate to the graphic, possibly because they were not directly involved in shopping for groceries.

The other popular design was the bowl. Several different bowl designs were used. The bowl with horizontal bars of foods (Fig. 9) was not successful, but the bowl with vertical bars (Fig. 10) was popular with low-income adults as well as the food industry.

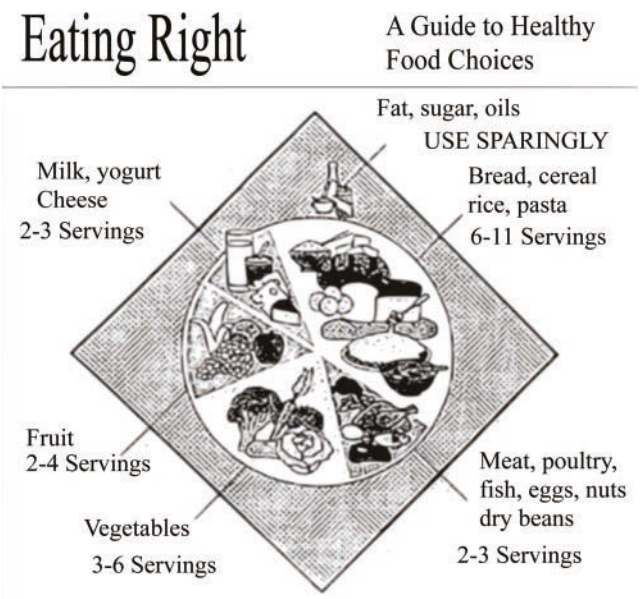

Figure 6. Pie Chart Graphic

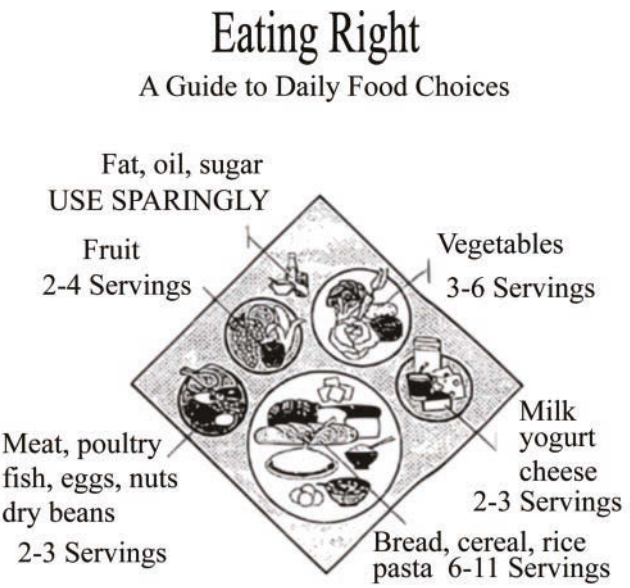

Figure 7. Circle Graphic

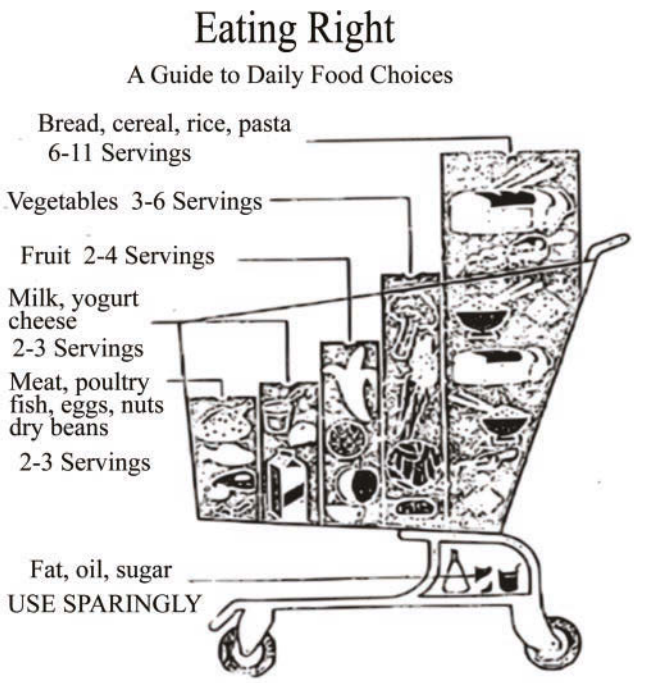

Figure 8. Grocery Cart Graphic

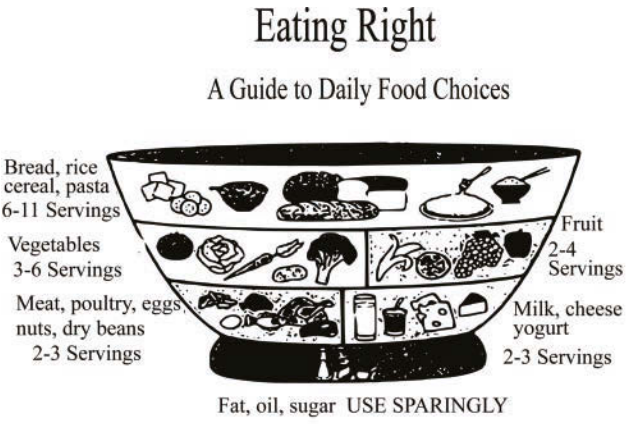

Figure 9. Bowl Graphic with Horizontal Bars

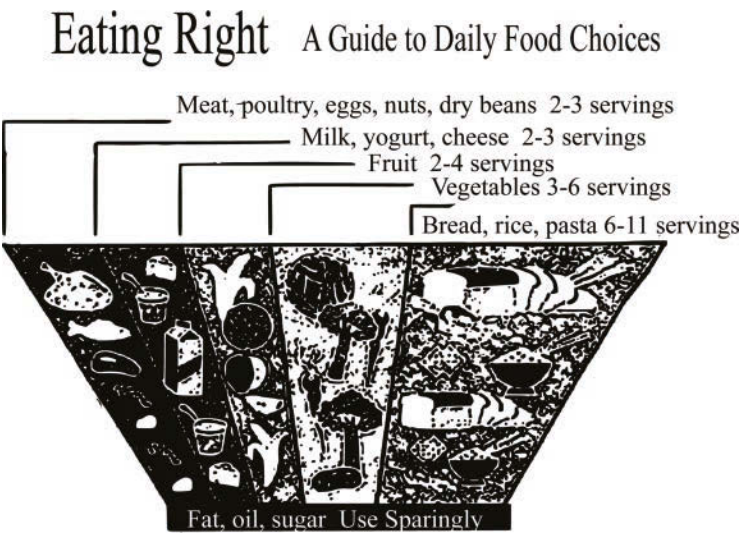

Figure 10. Bowl Graphic with Vertical Bars

Again, the food industry liked the fact that no food was placed higher than any other.

The final phase of testing focused on the two most popular designs, the pyramid (Fig. 11) and bowl (Fig. 12). Both had been modified in terms of the pictures used for the foods. There was still controversy over the use of symbols for fat and sugar instead of pictures of specific foods.

The graphics were tested on over 3,000 individuals across the range of ages, income levels, and educational status of the American population. The results are summarized in Table 3, adapted from the reference.

The pyramid scored higher, especially in the important category of the relative proportions of the various food groups. The only category where the bowl was more successful was in encouraging a variety of foods. The pyramid was found to be better understood than the bowl. There were concerns that people would misinterpret the pyramid by thinking that the foods on top were more important rather than the intended interpretation that they were to be used sparingly, but this did not show up in the results.

The use of the base of the bowl for fats and sugar did lead to misunderstanding by many people. They didn't realize that it represented things to eat

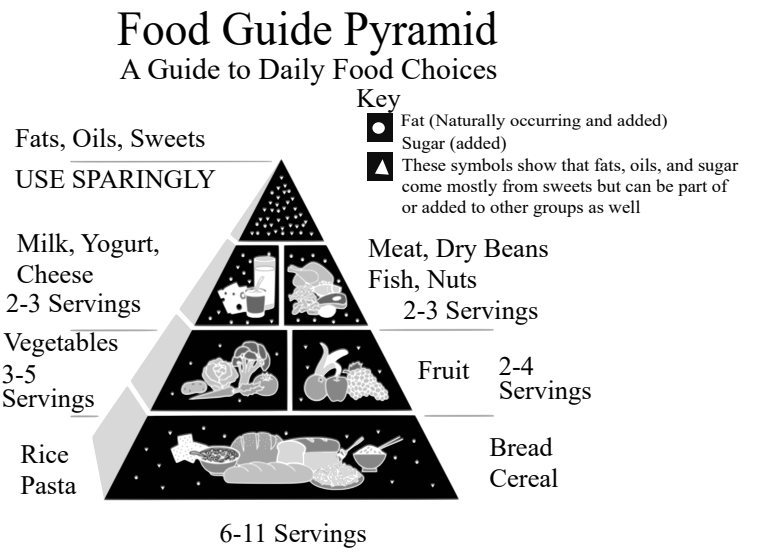

Figure 11. Final Pyramid Graphic with Key

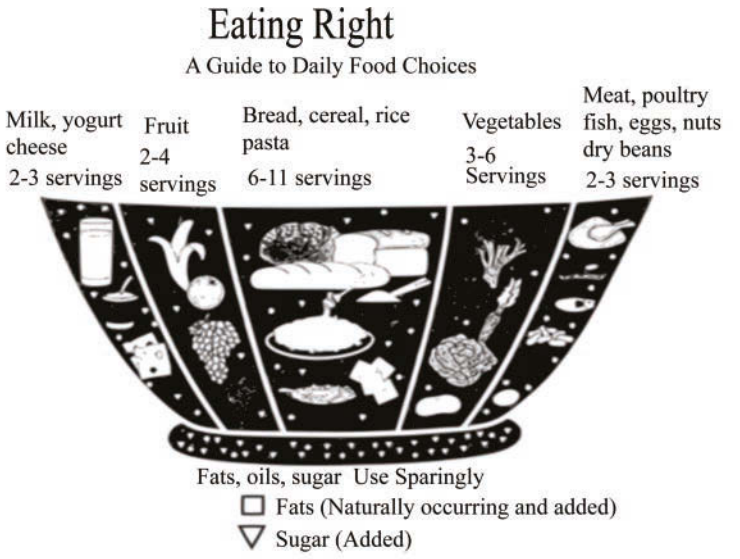

Figure 12. Final Bowl Graphic with Key

Table 3. Concept Communication of Food Graphics

	Overall Score 0–100 (Higher numbers indicate better communication of information)	
	Pyramid (1,217 Respondents)	Bowl (1,197 Respondents)
Variety	85	87
Proportionality	43	37
Moderation	22	19
Total	33	27

sparingly and thought it was just an artistic addition. Many people also interpreted the bowl to mean they should eat less meat and milk than intended.

Finally, the subjects were asked to pick their preferred graphic. The pyramid was preferred by 49% to 44% over the bowl. While the difference was small, it was statistically significant. The bowl appeared to be more popular with low-income and low-education groups. It was reasoned that the bowl visually relates better to eating food than does the pyramid.

In the end, the results of the study supported the pyramid as the best graphic but also showed that it would be most effective if it was accompanied by additional text.

1. Full text of Surgeon General's Report on Nutrition and Health 1988 is available at https://catalog.hathitrust.org/Record/007409595
2. Full text of Dietary Goals for the United States 1977 is available at http://zerodisease.com/archive/Dietary_Goals_For_The_United_States.pdf.

Summary of Surgeon General's Report Chapter 2: Relationship of Diet and Heart Disease (pp. 83–137)

Coronary heart disease (CHD) or cardiovascular disease consists of a number of related diseases that are all characterized by narrowing of the arteries. When the narrowing occurs in the heart, this can result in angina pectoris, heart attacks, and sudden death. When the narrowing occurs in the brain, it can cause an ischemic stroke, which is described as a deficiency of blood supply produced by constriction of vessels involved in the flow of blood. CHD is a process that occurs over many years or decades and begins with the development of fatty streaks in the arteries. These eventually become atherosclerotic plaques. The process also results in the arteries hardening and a rise in blood pressure. Over a half million fatal heart attacks occur in the US each year and 60% of the victims die before they can be treated in a hospital.

There are many factors that can contribute to the development of CHD. These include smoking, high blood cholesterol linked to a diet high in fat, and high blood pressure. The connection between these factors and the incidence of CHD has been established by numerous epidemiological studies over many years.

While the incidence of death from CHD has declined in the US due to improved treatment and lifestyle changes, CHD is still the largest single cause of death for Americans (Table 4). CHD is a major cause of disability, and the

Table 4. Prevalence of CHD and CHD Deaths per 100,000 Population (adapted from Surgeon General's report, pp. 85–86, 1988)

	Prevalence per 100,000 Population							
	White Men		Black Men		White Women		Black Women	
	CHD	CHD Death	CHD	CHD Death	CHD	CHD Death	CHD	CHD Death
Total	3,290	180.8	2,470	164.9	3,180	82.9	1,103	100.8
Under 45	90	8.2	160	13.2	130	1.7	110	4.3
45–64	8,090	294.5	4,440	317.8	6,510	85.1	4,630	161.1
65–74	17,560	1,132.6	10,700	990.6	14,390	506.0	6,220	645.9
Over 74	16,900	3,071.8	12,460	2,205.0	15,470	2,010.2	*	1,717.5

*Data did not meet reliability standard for report and is not included.

costs of treatment and lost productivity have been estimated as $49 billion per year.

The relationship between CHD and serum cholesterol has been extensively studied in multiple types of studies and in multiple animals and humans. There is a direct correlation between total serum cholesterol and the incidence of CHD, and there is no apparent minimum below which this correlation disappears. Cholesterol levels are expressed as milligrams (mg) of cholesterol per 100 milliliters of blood or 1 deciliter (dl). Studies show this effect even at cholesterol levels as low as 180 mg/dl. The average cholesterol level in the US adult population is 211 mg/dl for men and 215 mg/dl for women. People with values above 240 mg/dl are at significant risk of CHD.

Research on the chemistry of fats and CHD has produced three conclusions.

1. The higher the serum cholesterol, the higher is the risk for CHD and the severity of heart attacks.
2. Dietary saturated fats and cholesterol raise total cholesterol and low-density lipoprotein (LDL) cholesterol.
3. Polyunsaturated fats and monounsaturated fats lower total cholesterol and LDL cholesterol.

Disease of the arteries begins with an attack on the lining of the blood vessels by LDL particles and oxidized LDL. These cause inflammation of the lining inside blood vessels. Inflammation causes the formation of a plaque, which is a collection of cells from the artery wall, fats and cholesterol, platelets, blood proteins, collagen fibers, and white blood cells. The cells in the center of the plaque eventually die, a process called necrosis. A diagram of an atherosclerotic lesion is shown in Figure 13.

Serum cholesterol is divided for analysis into categories based on the size of the fat particles. Fats are often referred to as lipids. The fat particles are composed of triglycerides, cholesterol, and lipoproteins. Normal analysis of cholesterol reports the amount of low-density lipoprotein cholesterol (LDL), high-density lipoprotein cholesterol (HDL), and total cholesterol. Some analyses also examine even smaller particles, very low density lipoprotein cholesterol. In normal analysis, total cholesterol is the sum of LDL and HDL results.

LDL cholesterol is thought to be the major risk for CHD. LDL particles are responsible for depositing lipids on the walls of the arteries. LDL levels are related to diet, obesity, smoking, and diabetes. Most cholesterol is synthesized in the liver, but reducing dietary cholesterol below 300 mg/day has been shown

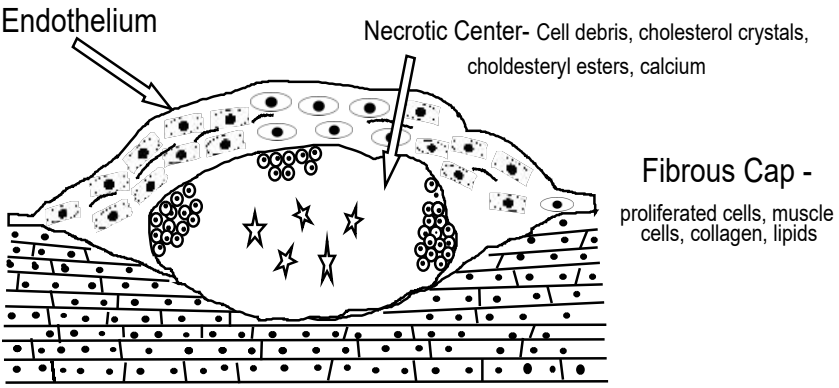

Figure 13. Atherosclerotic Plaque (from Surgeon General's Report, p. 88, 1988)

to reduce total serum cholesterol, possibly by influencing LDL receptors that are part of the system that regulates overall cholesterol synthesis and uptake. Evidence from tissue culture studies indicates that optimum levels of LDL cholesterol are as low as 25 mg/dl. Typical American values are 120 mg/dl.

HDL cholesterol levels appear to have the opposite effect from that of LDL's. Higher levels of HDLs are associated with lower risk of CHD. Exercise, weight loss, estrogen, and being female have all been associated with higher HDLs while smoking and obesity decrease HDLs.

RECOMMENDATIONS

A large number of studies have concluded that diet is the primary tool available to modify LDL cholesterol and CHD risk. These are summarized in Table 5. The average diet contains 37% of calories from fat, 13% of calories from saturated fat, and 300–400 mg of cholesterol every day. Studies in countries with lower dietary fat show a lower incidence of CHD. Realization of this fact has led all major health and dietary organizations in the US to make recommendations that total fat and saturated fat should be reduced. The only exception is for growing children, who need more fat for proper development.

Education programs have been developed to identify people at high risk and inform them of ways to reduce their risk.

In a 1986 report to Congress, the USDA and DHHS reported that serum cholesterol was a major risk factor for CHD and was linked to diet. They

Table 5. National Adult Treatment Classification (from Surgeon General's report, p. 94, 1988)

	Total Cholesterol (mg/dl)	LDL Cholesterol (mg/dl)
Desirable	<200	<130
Borderline High	200–239	130–160
High	>240	>160

jointly called for more research on the relationship and the variation in this link within the population.

KEY SCIENTIFIC FINDINGS

The response of serum cholesterol is different for different saturated fats. Saturated fats with less than 10 carbons or 18 or more carbons had essentially no effect on total cholesterol. Saturated fats with 12 and 14 carbons had a greater effect than 16-carbon fats, but all raised total cholesterol. Trans fats produced by partial hydrogenation of vegetable oils appear to have little effect on cholesterol, similar to other monounsaturated fats like oleic acid found in olive oil. In general, the amount of increase in serum cholesterol caused by a given amount of saturated fat is about twice the decrease caused by a similar amount of polyunsaturated fat. Efforts to develop quantitative measures to predict changes in cholesterol for specific changes in dietary fat have not been successful. Similarly, the response to dietary cholesterol is highly variable due to genetic and other factors.

A large number of epidemiological studies have been conducted internationally comparing various measures of CHD mortality and diet between different population groups. A fuller discussion of the details can be found in the original report available online. They include the Ancel Keys Seven Countries Study and others like it. They also include studies of immigrant groups who move from a country with low levels of CHD to countries with high CHD. The report concludes that CHD mortality increases with total dietary fat, dietary cholesterol, and consumption of animal fat and animal protein, total calories eaten, and total protein. Increased consumption of vegetable products decreased rates of CHD. There was no connection made between sugar consumption and CHD from the data, though some studies did find a link between high sugar consumption and CHD.

Studies within populations and studies using controlled diets, including the Framingham study, have produced less definitive results. It has been difficult to demonstrate a connection between dietary fat and serum cholesterol.

Dietary fat may operate by additional mechanisms as well. Different fatty acids have different effects on platelet aggregation. Heart attacks occur when platelets form a blood clot that blocks an artery in the heart. Some fats, like linoleic acid and fish oil have been found to decrease platelet aggregation. There are also different effects of unsaturated fats that have the double bond starting on the sixth carbon in the chain (omega 6) versus the third carbon (omega 3). Fish oils are particularly high in omega-3 fats while vegetable oils are high in omega-6 fats. The omega-3 polyunsaturated fats appear to offer greater protection. Fish oils have been shown to reduce inflammation in artery walls. Because inflammation is part of the process of initiating damage to the arteries, this may be the mechanism responsible for their higher protection.

OTHER FACTORS

Obesity is clearly linked to increased risk of CHD.

Alcohol appears to offer some protection from CHD when consumed in moderate amounts. The mechanism for this is not yet clear. It appears to raise HDLs. However, the consumption of alcohol has enough negative health consequences that it is not recommended in the Surgeon General's report as a way to reduce the incidence of CHD.

Diets high in fiber are associated with lower risk of CHD. It is not clear whether this represents a benefit of fiber or is a result of the fact that these diets are high in carbohydrates and low in animal products. Some studies have linked diets high in sugar to increased risk of CHD. Sugars have been shown to raise triglycerides in some studies.

No connection has been proven between vitamins and minerals and CHD. Vitamin C and Vitamin E have not been shown to decrease CHD incidence. There is a connection between low selenium levels and CHD in some populations, but the American population has enough selenium to rule this out as a possible concern.

A number of studies have shown positive benefits on the incidence of CHD for diets that are able to lower cholesterol levels and raise HDLs.

Clinical trials of drugs to reduce LDL cholesterol have shown reductions in CHD. However, no change in overall mortality rates from all causes was found

in these studies, suggesting that even a reduction in CHD deaths does not lead to an overall drop in mortality.

Summary of Surgeon General's Report Chapter 4: Cancer and Diet (pp. 177–247)

Cancer is the uncontrolled growth of cells that have escaped from the normal controls of cell division. Cancer is the second leading cause of death in the US. Over the past century, evidence has mounted that diet may be a factor in the occurrence and prevention of cancer. Studies have shown that whole grains, cruciferous vegetables (broccoli, cabbage, Brussels sprouts, etc.), and milk may offer some protection from cancer. On the other hand, overeating and obesity appear to make people more susceptible.

A number of studies in the 1950s–1970s demonstrated that underfeeding lab animals reduced the incidence of some cancers whereas high-fat diets increased some, especially breast cancer. (See the original document for specific references.) In 1964, the World Health Organization suggested that most cancers could be prevented, and recently, the National Academy of Sciences reviewed the evidence linking diet and cancer and issued an important series of recommendations.

The National Research Council noted in a 1982 report that when adjusted for the aging of the population, cancer rates except for lung cancer were relatively stable in the US. The primary cause of most lung cancer is known to be smoking cigarettes. Lung cancer accounts for the apparent increase in overall cancer rates. A person born in the US in 1985 has a 30% chance of dying from cancer, and almost 1 million new cases are diagnosed every year. Almost a half million people die from cancer each year. Within the population, Black males have a significantly higher rate of cancer, while Native Americans have a lower rate than the Caucasian population. These differences are probably due to lifestyle and environmental factors.

The cost of cancer treatment and loss of productivity is estimated to be at least $77 billion each year. Thus, prevention and treatment would have a significant economic impact.

Attempts to estimate the contribution of diet and other environmental factors have led to a range of estimates. It is estimated that 10%–75% of cancers are preventable. Studies have tried to determine whether this is due to diet,

Table 6. Estimated Causes of Cancer (adapted from Surgeon General's report, p. 180, 1988)

Cause of Cancer	% of Deaths (shown as a range)
Tobacco	25–40
Alcohol	2–4
Diet	10–70 (35% best estimate)
Food Additives	5–2 (Some foods are protective.)
Sexual Behavior	1–13
Occupation	2–8
Pollution	1–5
Industrial Products	1–2
Medicines and Medical Procedures	0.5–3
Geophysical Factors (radon, etc.)	2–4

lifestyle, or genetic factors. Studies of different countries and different groups within a country are useful for estimating the influence of lifestyle. In one study, non-Mormons had a 28% higher rate of cancer than Mormons, after correcting the data for the effects of smoking.

Estimates of lifestyle and dietary influences on cancer rates are shown in Table 6.

The comparison of cancer rates across geographical areas is shown in Figure 14. The dramatic differences observed must indicate that there are external factors causing these cancers.

Some cancers are actually declining. Stomach cancer rates have declined by over 50% in most developed countries over the past 35 years. The decline in the US has been 61%. At the same time, lung cancer rates have increased dramatically due to the effects of increased rates of smoking. The rate in the US has increased by 148% over this period. In Japan, the rate increased by over 400%. Of all of the countries studied, Austria was the only one that had a small decrease.

Further support for environmental factors comes from studies of immigrants. Comparisons of immigrants to people who remain in their home country demonstrate that a change in diet and other environmental factors can either increase or decrease the rate of specific cancers. A study of Filipino immigrants to Hawaii found increased rates of colon, thyroid, prostate, and

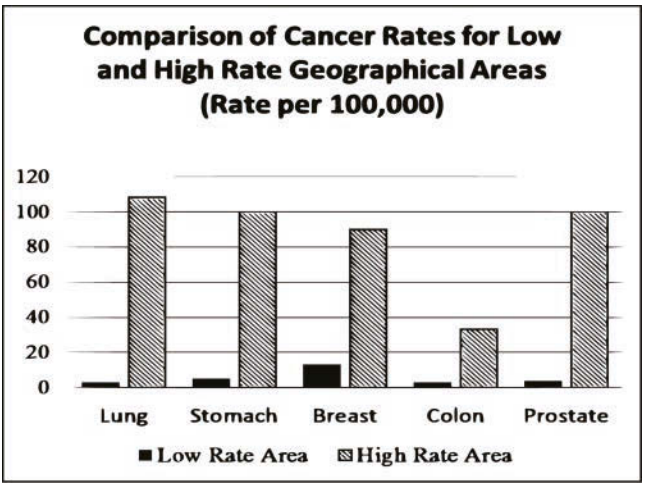

Figure 14. Comparison of Cancer Rates between Geographic Areas (adapted from Surgeon General's report, p. 180, 1988)

breast cancer. At the same time, rates of stomach, liver, and cervical cancer declined.

Rates of cancer due to food additives and contaminants in the US food supply are believed to be very low. The strong regulation and testing of the food supply by the Food and Drug Administration prevents this from being a significant cause.

Formation of cancer is a multistep process and dietary factors can play a part at several different points. Carcinogens start the process by altering the DNA or the regulation of DNA expression in a cell. Carcinogens can act directly, or a substance can be metabolized in the body to form a carcinogen. The initial alteration of the cell DNA is normally corrected by repair mechanisms in the cell. Another place at which external factors can influence the process is by interfering with the normal repair mechanism or by promoting the change of the altered cell into a malignant cancer. This is a multistep process, and there are many ways that diet and other factors can play a role, both positive and negative. The conversion to malignant cancer and the growth of cells to a stage that can be detected as cancer is very slow, possibly requiring many years. This makes it particularly difficult to identify the factors present at the onset.

The ways that diet may influence the process were summarized in the Surgeon General's report as follows:

- Carcinogens may be present in foods naturally or through contamination. Or they may be formed during cooking or preservation.
- Carcinogens produced during metabolism (for example, oxygen radicals and lipid hydroperoxides) may be activated or deactivated by dietary components such as selenium or beta-carotene.
- Bacteria in the intestines may convert food or bile acids into carcinogens or promoters of cancer. The nature and activity of these bacteria are related to diet.
- Fats may enhance the promotion stage of cancer formation.
- Vitamins like Vitamin A may reduce the promotion stage of cancer formation.
- Improper balance of nutrients effects the immune system and the body's ability to repair damage to DNA and cellular material.

Many cancer patients suffer from malnutrition due to the effects of the cancer and the side effects of treatment. Efforts to improve treatment by including better nutrition and by supplementing various vitamins have not proven to be effective.

The primary way that the relationship between cancer and external factors has been studied is through epidemiological studies. These are useful to identify associations to suggest further studies but can never be used to prove a cause-and-effect relationship between cancer and a specific factor like diet.

The weakest type of epidemiological studies use population data (ecologic studies). For these studies, populations are identified that have different cancer incidence and different dietary and environmental factors. Researchers look for factors that have either a positive correlation with the cancers, suggesting they may be causal factors, or negative correlations, suggesting some level of protection. Because one is dealing with whole populations and there are many variables involved, interpretation of the results can be difficult and even misleading.

Ecologic studies provide access to more people and a wider range of possible factors, but they introduce large uncertainties since exposure and behavior data are averages. Cohort studies involve fewer people and a more limited range of factors. All epidemiological studies are limited in that they can identify possible associations but cannot prove the cause-and-effect relationship.

Figure 15 shows an ecologic study of possible connections between dietary fat and breast cancer.

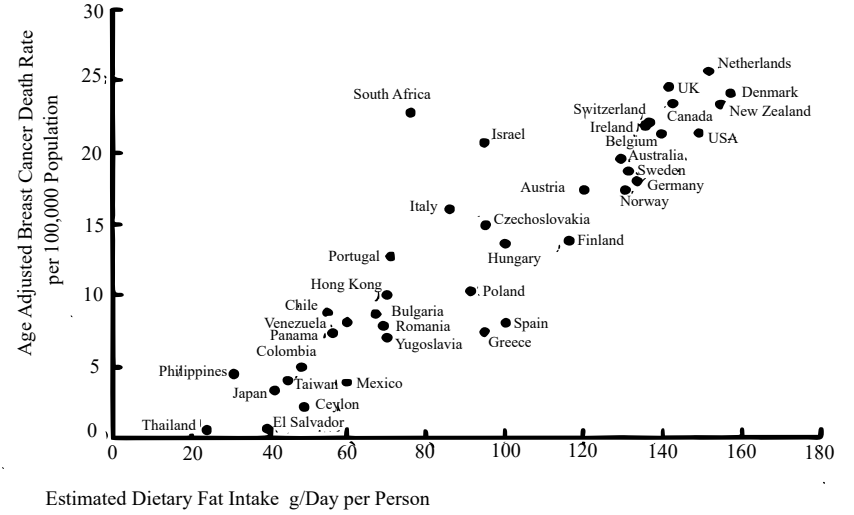

Figure 15. Dietary Fat Intake and Breast Cancer (from Surgeon General's report, p. 187, 1988)

Studies such as this suffer from numerous problems—most notably the fact that there may be other factors unrelated to the one studied that change in the same way, such as dietary fat and obesity or consumption of animal products. They also often use death certificates rather than incidence of cancer as the marker. In some countries, death certificates may not accurately reflect the cause of death.

Case control studies compare individuals with a specific cancer to similar people without the disease. While these studies often report relative increase in risk associated with a specific factor, they suffer from several problems. The control group may not be close enough in overall characteristics to the people with cancer. In addition, due to the long time required to develop most cancers, people may not provide accurate information on their exposure to the risk factors being studied. And as with the ecologic studies, researchers in these studies can't prove that variables not included in the study are not responsible for the disease.

Cohort studies select a group of individuals based on different exposure to the target of the study and then follow them over time to see the difference in outcome. This removes the problem of people trying to recall their diet over

20 years or more. However, these studies require a long time to produce results. There is still the possibility of variables that are not studied.

Double-blind clinical trials are the only way to determine cause-and-effect relationships for diseases. These assign people randomly to groups who receive different treatments. In the case of diet studies, a group of women at high risk for breast cancer could be assigned to diets with different amounts of fat or other nutrients. The people are then followed for a number of years and the outcomes monitored. These studies are difficult and expensive. A large number of subjects are required. If the people in the study can identify whether they are in the control group or treatment group, there are confounding effects due to the placebo effect. There may also be problems with compliance with the protocol due to the long time required for such studies.

Animal studies are widely used to identify whether specific dietary components lead to cancer. While these studies allow careful control of the variables, it is not always clear how to relate animal studies to humans. Also animal studies use only a single, highly inbred strain of the animal, and this introduces additional uncertainty for interpreting how the outcome applies to a genetically diverse human population exposed to a variety of environmental factors.

Dietary studies are complicated by the fact that any nutrient has multiple components and that nutrients may interact. A high-fat diet may also be high in calories. If a statistical correlation is found for a disease, it may not be clear which factor is responsible. Multiple components may also act synergistically. A synergistic interaction is one where the combination of two or three food components produces a result that is greater than the sum of the components eaten individually. An example is the fact that low selenium increases the risk of cancer by a factor of 5.8 and a deficiency in Vitamin E increases risk by a factor of 1.6. When both risks are present, the rate of cancer increases by a factor of 11.4. Synergism can enhance the risk as noted in this study, but it could also inhibit the formation of cancer. It is extremely difficult to study this due to the large number of natural chemical components in foods.

In spite of the many limitations noted for these studies, there is a clear consensus that changing diet can reduce risk of cancer.

Table 7 summarizes some associations that have been made.

The National Cancer Institute has released a series of recommendations for a healthy diet (adapted from the Surgeon General's report, p. 192, 1988).

- Fat intake should be 30% or less of total calories.
- Fiber should be at least 20 grams per day up to 35 grams per day.

Table 7. Associations between Diet and Cancer (adapted from Surgeon General's report, p. 191, 1988)

Site of Cancer	Dietary Fat	Total Calories and Weight	Fiber	Fruits and Vegetables	Alcohol	Smoked, Salted, and Pickled Food
Lung				–	+	
Breast	+	+		–	+	
Colon	+	+	–	–		
Prostate	+	+		–		
Bladder				–		
Mouth				–	+	
Stomach				–		+
Kidney		+				
Cervix		+		–		
Esophagus					+	+

Note: Positive (+) symbol means that the food increased the risk of cancer, and negative (–) symbol means eating more of the food decreased the risk of cancer.

- Eat a variety of fruits and vegetables every day.
- Maintain proper weight.
- If consuming alcohol, do so in moderation.
- Limit consumption of smoked, salted, and pickled foods.

These recommendations are consistent with those released by the American Cancer Society, the American Heart Association, the USDA, and the DHHS.

The association between dietary fat and cancer is strong and has been widely studied. The Surgeon General's report details a number of these studies on pages 194–98. In addition to epidemiological studies, there are animal studies that support those findings. Biochemical mechanisms for this association include directly causing mutations leading to cancer and acting as promoters for carcinogens by enhancing their effects. There is some evidence that certain polyunsaturated fats are more strongly associated with cancer than saturated fats.

The association of total calories and obesity with cancer is supported by a wide range of epidemiological studies, including cohort studies, and by animal studies. The exact mechanism for this association is not yet clear.

The association between low consumption of dietary fiber and increased risk of colon cancer is particularly strong.

Summary of Article on Diet and Heart Disease for Factions 3 and 4

Gordon, T., et al., "Diet and Its Relation to Coronary Heart Disease and Death in Three Populations," *Circulation*, pp. 500–15, 1981

This article provides evidence that total fat is not related to heart disease and that the only true correlation is between heart disease and exercise. People in the study who were more physically active had lower rates of coronary heart disease (CHD). This should be used in the arguments that fat and meat are not really a problem. In fact, people who ate more total calories had significantly reduced heart disease.

The paper reports the results of three prospective epidemiological studies. In each study, a group of men between the ages of 45 and 64 was identified who had no existing CHD. Each subject reported their food consumption for a 24-hour period. The subjects were then followed for six years to observe their incidence of CHD and other causes of death. Some subjects in the study had other diseases but not CHD. Subjects were enrolled between 1965 and 1968.

The three groups studied were as follows:

1. Participants in the Framingham Heart Study begun in 1948 who met the criteria for this study in 1965 when this study began.
2. Men living in rural and urban areas around San Juan, Puerto Rico.
3. Men of Japanese ancestry who lived in Honolulu during World War II and were still living in the area when the study began.

Some differences were known to exist in the ways that various forms of CHD were diagnosed in the three studies. Previous studies that attempted to correct for differences in diagnosis found that the incidence of CHD in Puerto Rico and Honolulu was half that in the Framingham study.

The data were analyzed by two statistical methods. In the first, the average nutrient intake for subjects who died was compared to those who were still alive. This was used to identify nutrients that were associated with greater and fewer numbers of deaths. Following this, a logistic regression analysis was done to fit the level of each nutrient with the increase in risk. This allowed a determination of the dose-effect relationship.

The diet of the Framingham subjects included more protein, saturated and monounsaturated fat, sugar, and alcohol than the other two groups. All groups

ate similar amounts of polyunsaturated fat. The Framingham group ate less starch than the other two groups and had higher total calories and weight.

In all three populations, the men who developed CHD had eaten fewer total calories; fewer complex carbohydrates from fruits, vegetables, dairy, beer, and wine; and less alcohol than the men who did not develop CHD. The men with CHD had also eaten a higher ratio of polyunsaturated fats to saturated fats. The correlation was present in all three groups but only statistically significant for the men from Puerto Rico. There was no significant or consistent correlation between dietary cholesterol and CHD. The Framingham data was corrected for the effect of alcohol consumption on total calories. When this was done, there did not appear to be any relationship between total calories, total carbohydrates, or complex carbohydrates and the incidence of CHD. Correcting the Puerto Rico and Honolulu groups for the calories in alcohol showed that men who died from a heart attack (myocardial infarction) or CHD had eaten fewer calories and fewer carbohydrates, mostly less starch, than the healthy men.

Tables 8–10 show the results in terms of rate of CHD per 1,000 people.

Overall analysis of the entire data corrected for known risk factors shows that increased total calories, increased starch, and increased alcohol were correlated with a reduced risk of death by CHD.

The positive effects of alcohol consumption led the authors to examine other causes of death besides CHD. In the Honolulu study, men with higher alcohol consumption had higher rates of death from other causes. In all three groups, those who drank less alcohol did not show a higher risk of death from all causes.

The connection between death from all causes and total calories showed that in all groups, those who consumed more calories had lower risk of death, but the data was less statistically significant in the Honolulu group than the other two groups.

In the Framingham and Honolulu studies, higher alcohol consumption was associated with higher high-density lipoprotein cholesterol (HDL) and lower low-density lipoprotein cholesterol (LDL). In the Puerto Rico and Honolulu studies, higher consumption of starch was associated with lower serum cholesterol. These results were consistent regardless of whether the data were taken as total consumption or as percentage of total calories.

All three groups showed higher blood pressure with increased alcohol. This is consistent with the observation that the group with higher alcohol consumption had a higher incidence of stroke.

Table 8. Total Calories and CHD in Three Populations

Daily Caloric Intake	Framingham Rate/1,000	Puerto Rico Rate/1,000	Honolulu Rate/1,000
<2,000	87.5	23.2	26.6
2,000–2,499	59.1	23.5	25.8
2,500–2,999	69.1	14.2	17.1
3,000–3,499	40.7	16.3	17.9
3,500 or more	10.8	13.8	8.7
Total	59.3	19.8	22.5

Table 9. Dietary Starch and CHD in Three Populations

Daily Starch Intake (g)	Framingham Rate/1,000	Puerto Rico Rate/1,000	Honolulu Rate/1,000
<100	68.1	22.7	31.9
100–149	43.2	27.2	24.2
150–199	84.5	14.9	19.3
200–249	55.5	18.0	12.7
250–299	–	20.6	33.6
300 or more	–	9.5	9.5
Total	59.4	19.8	22.5

Table 10. Alcohol Consumption and CHD in Three Populations

Daily Alcohol Intake (g)	Framingham Rate/1,000	Puerto Rico Rate/1,000	Honolulu Rate/1,000
None	91.6	21.5	25.8
1–14	44.8	11.0	24.9
15–39	39.4	13.5	17.1
40 or more	20.4	17.0	7.2
Total	59.3	19.8	22.5

All three groups showed an increase in incidence of CHD with increasing dietary fat when the fat was computed in terms of percent of calories, but the correlation was not present when the absolute amount of fat was used.

All three groups showed a decrease in risk for CHD with increasing total caloric intake. The groups differ in the source of these calories, with the Honolulu and Puerto Rico groups having more calories from starch. The

Framingham group had more calories from fat and protein than the other two. The Framingham group had the highest total calorie intake and the highest risk of CHD of the three groups, but when total calories per kilogram (calories/kg) of body weight was used, the Framingham group actually had the lowest calories/kg weight and the Honolulu group the highest. This result is consistent with the overall observation that lower caloric intake is associated with a higher rate of CHD. The higher calories/kg body weight for the Honolulu group suggests this group gets more exercise, and more exercise correlates with lower risk of CHD.

The results for the connection of starch consumption and CHD between the groups may well be due to differences in the sources of the starch and hence to other components in those foods rather than just the total starch. Also, the seemingly protective properties of starch may be related to clotting factors rather than an effect on serum cholesterol.

The authors conclude that the relationship between total calories and CHD suggests a recommendation for more exercise. The protective effects of alcohol on CHD are offset by the negative effects of alcohol on other diseases. Therefore, increasing alcohol consumption is not recommended. Increasing starch consumption will almost always decrease fat consumption. They conclude that current dietary programs are correct.

Summaries of Papers on Diet and Cancer

Willett, W., "Implications of Total Energy Intake for Epidemiologic Studies of Breast and Large Bowel Cancer," *American Journal of Clinical Nutrition*, 45:354–60, 1987

This article reviews the numerous studies that have found an association between diet and the incidence of some cancers, notably breast and colon cancer. These cause more deaths from cancer than smoking, which is the primary cause of lung cancer. These studies include epidemiological studies and animal studies.

The most important question to be answered is whether the cancers are due to total calories eaten or are related to specific components of the diet, such as fat. The answer to this question is critical in order to make dietary recommendations for the US public. Some studies have indicated association with specific nutrients. Recent animal studies have shown that reducing total calories rather than reducing fat in the diet reduced the incidence of

breast tumors. Other studies have also shown that if the total calories eaten are reduced enough to cause significant weight loss, the risk of breast cancer is reduced.

Studying the impact of total caloric intake on a human population is much more complex than using animal models. Humans have different body sizes and varying levels of physical activity. The energy expended is used to digest food, sustain the basic metabolic functions, maintain body temperature, and provide energy for physical activity. Each of these factors varies within the population.

Careful measurements of resting energy consumption have demonstrated that the basal metabolic rate is closely related to body weight. Therefore, weight and level of physical activity are possibly the two most important factors that account for the variation of calorie use between individuals. While most of the daily calories consumed are used to power basic metabolic functions, across the population variations in activity are more important for the variation in total calories used.

Given the variation in how energy is used across the population, epidemiological studies that only look at total calories probably will not provide useful information. Personal reporting of diet is known to be highly inaccurate, and reporting of physical activity is even less reliable. If one attempts to control a study of cancer and diet for these two variables, the results will almost certainly be unreliable due to the large errors in the variables being studied.

Epidemiological studies of diet and cardiovascular disease are another case of the same problem. The only dietary variable that reliably relates to coronary heart disease (CHD) is total calories eaten, with more calories being associated with a lower risk of CHD. This does not imply that people should eat more to reduce their risk, but that the underlying reason is exercise. More exercise leads to less CHD and also to eating more total calories.

The physiological response to excess calories in the diet is complex. The body has the ability to compensate to some extent for excess calories by reducing metabolic efficiency, thereby maintaining weight over a range of caloric intake. This makes it difficult to interpret the impact of weight gain on cancer rates. It is difficult to know if the change in cancer with more calories is due to accumulation of fat or to changes in the metabolic efficiency of the body.

COLON CANCER

A case control study of colon cancer and diet (Jain et al.) involved two groups, a control group and a group of patients who reported that they ate 200–300 calories per day more than the healthy controls. Over the course of several years, the patients would have been expected to gain 10–15 kg of body weight based on the reported diets. However, the two groups had similar weights. One must then conclude that the patients with cancer were either exercising more or were metabolizing their food less efficiently.

Until studies of the relationship between physical activity and colon cancer and between metabolic efficiency and cancer are completed, it is not possible to reach any conclusions between total calories and colon cancer. It does seem safe to conclude that dieting to reduce body weight will not reduce the risk of colon cancer.

BREAST CANCER

Some epidemiological studies comparing different countries have suggested an association between the percentage of calories from dietary fat and breast cancer. However, there are other possible explanations. One study showed an association between larger body size and more breast cancer risk. This means that the low incidence in Japan could be due to the fact that the population studied had insufficient food and that led to reduced body size. The apparent positive association between dietary fat percentage and breast cancer would then be due simply to an overall larger size among those eating more fat. Studies showing that Japanese immigrants' children in the US experience a change in incidence could also be due to better nutrition available in the US. A study of women in Holland also suffers from the same possibility of limited nutrition during development leading to smaller body sizes.

A large study by the American Cancer Society found only a small association between obesity and breast cancer. This study has several problems, including the fact that it used death from breast cancer instead of incidence of breast cancer. Other studies show that the relationship is different for premenopausal women and postmenopausal women. Before menopause, obesity appeared to reduce risk and after menopause it appeared to increase risk. However, additional factors are also involved. Small, thin women are diagnosed with more small tumors that are less likely to metastasize. Small tumors are harder to find in obese women. This fact creates a bias due to the

differences in diagnosis. Obese women may have higher death rates due to the fact that their tumors are not detected soon enough.

The international epidemiological relationship between dietary fat and breast cancer can also be attributed to early dietary restrictions that led to small body size. This is not a useful strategy for reducing incidence of breast cancer.

In conclusion, the international comparisons that led to the association between total calories and the incidence of colon and breast cancer can also be explained by variations in total body size resulting from childhood calorie restrictions. Whether or not early calorie restriction will reduce risk is of little value since people are not likely to follow such a program.

Kolonel, L., "Fat and Colon Cancer: How Firm Is the Epidemiologic Evidence?" *American Journal of Clinical Nutrition*, 45:336–41, 1987

This article shows that there are many studies indicating an inverse relationship between meat consumption and cancer. This can be used to argue that the evidence for restricting meat consumption to enhance health is unclear and such dietary recommendations would be premature.

A number of epidemiological studies of colon cancer have been conducted using data from over 30 countries and for groups within countries. International studies and a study comparing health districts in Japan that showed an association between high dietary fat and colon cancer also showed a similar association with animal protein and colon cancer. On the other hand, studies comparing all 48 states in the US, Mormons and non-Mormons in Utah, and nuns in Great Britain found no association between dietary fat or animal protein and colon cancer. One study of Japanese immigrants to Hawaii found no association with fat but an association with animal protein. These results show the questionability of such population studies and the inability to deal with confounding factors.

A number of case control studies have also been conducted. These match colon cancer patients with controls who have similar diet and lifestyle. While these studies are normally more effective in finding associations, the results are contradictory. Some studies find associations with dietary fat or total calories and some do not.

Some studies have suggested that dietary fat interacts with dietary fiber and that fiber is an important confounding factor that must be considered.

While the results are still not clear, it appears that high animal protein or high fat when coupled with low dietary fiber increases the risk of colon cancer. Fiber may be protective by interaction with bile acids or by increasing the rate of transit through the colon. Theories that dietary fat influences the composition of bile acids in the stool have been studied, but nothing conclusive has been learned.

Studies of total calorie consumption and colon cancer have also been inconclusive. Studies that found an association between fat and colon cancer often found a similar association with total calories. Those that found no association with fat also tended not to find an association with calories.

In conclusion, epidemiological studies have not yet been able to demonstrate a clear association between dietary fat and colon cancer, though many of the better studies do show an association. Because high consumption of fat correlates with high total calories, the possibility that total calories are an independent risk factor for colon cancer should be investigated.

Washington Post News Reports on USDA Food Pyramid Controversy

Sugarman, C., and M. Gladwell, "U.S. Drops New Food Chart; Meat, Dairy Groups Press Agriculture Dept.," *The Washington Post*, April 27, 1991, First Section, Page A1

This article details the decision of the Secretary of Agriculture to drop the Food Pyramid chart after several years of development by the USDA and the role that agricultural interests played in this decision. Nutritionists were excited about the new graphic that emphasized fruits, vegetables, and grains over meat and dairy. They hoped that the pyramid graphic would do a better job of communicating their dietary recommendations and lead people to improve their diet.

Representatives from the meat and dairy industry met with officials at the Department of Agriculture to protest two aspects of the food pyramid graphic. They were angry that the size of the portions for meat and dairy were small relative to other food groups. They also didn't like the hierarchy implied by the pyramid that some foods were good and others were bad or to be eaten in smaller amounts. They felt consumers would interpret the pyramid to mean they should significantly reduce their consumption of meat.

This decision follows a recent change by the Environmental Protection Agency (EPA) to drop their recommendations about environmentally friendly cleaning products after intense pressure from consumer product companies. Both the EPA and USDA decisions call into question the ability of federal agencies to make decisions based on the best science when that runs counter to special interests.

> "The lesson here is that the Department of Agriculture should not have primary responsiblity for nutrition education in this country," said Bonnie Liebman of the Center for Science in the Public Interest here. "USDA is just what the name says, the Department of Agriculture. It consistently puts the interests of the meat, egg and dairy industries ahead of the public's health."

Secretary Madigan defended his decision on the basis that the pyramid might be confusing to children and argued that he was not persuaded by any one argument made by the food industries. He did indicate that the totality of the opposition played a role in his decision.

Nutrition experts such as Marion Nestle of New York University were not convinced by Madigan's protest.

> "There is a long history of this," she said. "The Agriculture Department is in the position of being responsive to the agriculture business. That is their job. Nutrition isn't their job. When we wrote our history (of dietary guidelines), I was impressed at how strongly the food industry has always been involved in dietary guidance."

Sugarman, C., "Catering to Cows and Consumers; Is the USDA Caught in a Conflict of Interest?," *The Washington Post*, June 5, 1991, Page E1

This newspaper report focuses on the inherent conflict within the USDA, which has the responsibility to both promote proper nutrition and also to promote the meat and dairy industries. The decision to withdraw the USDA Food Guide Pyramid is thought to be due to pressure from the cattle and dairy industries, though USDA officials deny this. Various commodity groups oppose the pyramid because they believe it implies that some foods are good and some are bad by their placement in the pyramid.

> "I think it's impossible to ask one agency to wear two different hats like that," said Linda Schwartzstein, a George Mason University associate professor of

> law who is writing a book on government nutrition policy. "I think it's directly in conflict. It's an impossible mandate."
>
> "This is such a blatant example of conflict of interest that something really needs to be done," said Marion Nestle, chairman of the department of nutrition, food and hotel management at New York University.

The article quotes Nestle as stating that as far back as 1890, the earliest research at the USDA on diet and nutrition by W. O. Atwater showed that Americans should reduce their consumption of fatty meats and sugar. However, the first set of dietary guidelines did not include this recommendation. Pressure from industry groups have insured that the USDA recommendations always state that any food can be part of a healthy diet if used in moderation. A 1980 USDA publication that recommended reductions in red meat, "Food: The Hassel Free Guide to a Better Diet," was allowed to go out of print. Nestle attributed this and the failure to produce a replacement to pressure from dairy, meat, and egg producers.

The degree to which the USDA is supportive of the meat and dairy industry is made clear by statements by Agriculture Secretary Madigan:

> "[M]ilk producers and the dairy industry expect help from elected officials and the administration. We must give them that help as rapidly as possible."
>
> Madigan described how he told his nutrition information staff "to respond quickly with the facts to any charges that dairy products are unhealthy." The paragraph went on to say that it is important that the American public knows that the federal government recommends dairy products as "a healthy and essential element of our daily diet."

Nutritionists at the USDA claim they use the best science in developing their recommendations. Former Agriculture Secretary John Block also is reported to have pointed out that those who criticize the USDA are also interest groups with their own "ax to grind." The USDA is pressured from all sides. Block also questioned the very idea that the government should be involved in giving nutrition advice. He is quoted as saying, "Even pigs, given a free choice, will do a reasonably good job of balancing their ration."

Groups who oppose the USDA role, such as the Center for Science in the Public Interest, believe the role of industry in decisions at the USDA is too large. Industry groups counter that their influence is exaggerated. Some

industry experts also argue that it is important to have nutritional research and promotion of agriculture in the same agency. Their rationale for this is that it is the way to insure that more nutritional products are developed by the agriculture and food industries.

Nancy Chapman, a nutritionist and former Congressional staffer, believes that nutritional experts at the USDA have not been active enough in using their role to influence agricultural production and the school nutrition programs to promote better health. Nutritionist have called for reducing fat in the school lunch program, so this would provide an opportunity for USDA nutritionist to assert themselves. Another area is in food labeling. The FDA and USDA have both proposed labeling for processed meat and poultry. The USDA rules are widely viewed as more favorable to the food industry than those of the FDA.

Ellen Haas, executive director of the consumer group, Public Voice for Food and Health Policy, is another critical voice who is given the last word in the article: "Not only has the department neglected nutrition, but there has also been an historical neglect of food safety issues, and it's been unresponsive to sustainable agriculture," said Haas. "A change in direction has to start at the top."

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A Quick Guide to the Nutrients[4]

This section is provided to help you understand unfamiliar terms in your readings and present a quick overview of basic nutrition. Please do not feel that you are expected to know this unless you are taking a course in nutrition, and in that case you will have covered this information prior to playing the game.

Good nutrition contributes to good health because it allows your body to function properly. A chronic deficiency of even one nutrient can have a dramatic effect on your body's ability to carry out its normal functions. It is not surprising that the top chronic diseases in the US, including heart disease, cancer, stroke, and diabetes are thought to have a nutritional component. Good nutrition may play an important role in reducing the risk of developing each of these chronic diseases.

Nutrients work closely together to provide energy, structure, support, and regulation of body processes. Some nutrients are used solely to provide energy for the body. Some nutrients do not provide energy but are essential for body processes. Table 11 summarizes the nutrients and their functions.[5]

Energy Nutrients

The energy nutrients include carbohydrates, proteins, and fats, all of which can be used by the body as fuel, which we describe as calories.

Carbohydrates can be divided into two major categories—simple and complex—as shown in Table 12.

4. This document reflects knowledge in 1991. Information, particularly about fats and some vitamins, has been revised by subsequent research.

5. Blake, J., *Nutrition and You*, Benjamin Cummings, p. 6, 2011.

Table 11. Function of Nutrients

Nutrient	Energy	Growth, Maintenance, Support, or Structure	Regulate Body Processes
Carbohydrates	yes	no	no
Proteins	yes	yes	yes
Fats	yes	yes	yes
Fiber	no	no	yes
Vitamins	no	yes	yes
Minerals	no	yes	yes
Water	no	yes	yes

Table 12. Characteristics of Simple and Complex Carbohydrates

Simple Carbohydrates	Complex Carbohydrates
quickly absorbed into bloodstream	slowly absorbed into bloodstream
Blood sugar levels rise and fall rapidly.	Blood sugar levels stay fairly constant.
contain no or very little fiber	contain substantial amounts of fiber
found in soda, juice, candy, and refined products such as white bread, white flour, white potatoes, white rice, and most chips and crackers	found in minimally processed and whole grain foods such as whole wheat bread, whole grain cereals, oats, brown rice, sweet potatoes, and legumes, including kidney beans

Table 13. Types of Fats and Their Sources

Type of Fat	Sources
Saturated	found in meat, dairy products, and coconut and palm oils
Monounsaturated	found in plant sources such as avocados and oils such as olive, canola, and peanut
Polyunsaturated	found in plant sources and oils such as safflower, sunflower, soybean, corn, and cottonseed
Cholesterol	found only in foods from *animal* sources such as meat, fish, milk, eggs, cheese, and butter

Fats are a concentrated form of energy and serve many essential functions, including maintaining normal body temperature; cushioning and, therefore, protecting vital organs; carrying fat-soluble vitamins; and providing the starting materials for hormones and vitamins. The different types of fat found in foods are shown in Table 13.

High-density lipoproteins (HDLs) and low-density lipoproteins (LDLs) are molecules found in the bloodstream that transport cholesterol and triglycerides in and out of the body. HDLs remove cholesterol from the blood and prevent their deposition inside major blood vessels. LDLs deposit cholesterol in artery walls and are associated with an increased risk of coronary heart disease.

Proteins are essential in forming red blood cells, antibodies, immune-proteins, enzymes, and hormones. Proteins are needed for the growth and repair of body tissues as well as for maintaining proper fluid balance and proper acid-base balance.

Foods that include meat, milk, cheese, and eggs are complete proteins that contain all the essential amino acids. Other sources of protein include whole grains, rice, corn, beans, legumes, oatmeal, peas, and peanut butter and, when eaten together, also constitute complete proteins. For those who do not eat meat, eggs, or dairy products, it is important to eat a variety of these other foods in order to get the proper balance of amino acids.

Non-Energy Nutrients

The non-energy nutrients include minerals, vitamins, fiber, and water. While these do not provide energy, they are essential in utilizing the energy contained in the energy nutrients.

Minerals are inorganic elements that are needed in small amounts to help you metabolize the foods you eat. Table 14 of minerals, their role, and food sources follows.

Vitamins come in two types, fat soluble and water soluble (Tables 15 and 16). Fat-soluble vitamins can be stored in the body for long periods of time, while excess amounts of water-soluble vitamins are excreted in the urine.

Water functions as a medium to dissolve molecules and allow them to come in contact with each other to carry out essential reactions. Water is used to transport vital nutrients and then remove waste products from the body. Water acts as a coolant to both absorb and release heat and to maintain a normal internal temperature. Water acts as a lubricant for joints, eyes, and the intestinal tract. Finally, water acts as a cushion to protect vital body organs.

Fiber is a non-digestible component of complex carbohydrates and can be divided into two broad categories, soluble and insoluble (Table 17).

Table 14. Sources and Roles of Minerals

Mineral	Key Roles	Food Sources
Sodium	needed for nerve and muscle function, maintenance of normal blood pressure, and at high levels may be associated with high blood pressure	processed foods, prepackaged foods, deli meats, smoked foods, olives and pickled foods, table salt, heavily salted foods such as chips and French fries, and foods containing MSG
Potassium	essential for maintaining proper fluid balance, nerve and muscle function, and normal heart function	bananas, raisins, apricots, oranges, avocados, dates, cantaloupe, broccoli, spinach, carrots, peas, lentils, peanuts, milk and dairy products, lean meats, potatoes, and dried beans
Calcium	needed for healthy bones and teeth, normal blood clotting, and nervous system function	milk and dairy products, salmon with bones, broccoli, cabbage, and tofu
Iron	needed to form hemoglobin, the molecule in red blood that carries oxygen to all cells	meats, eggs, dark leafy greens, legumes, whole grains, and enriched food products
Phosphorus	needed for healthy bones and teeth, energy metabolism, and acid-base balance in body fluids	milk, grains, and lean meats
Magnesium	needed for healthy bones and teeth, proper function of the nervous system, and energy metabolism	milk and dairy products, meat, fish, poultry, legumes, and green vegetables
Zinc	needed for cell reproduction, tissue growth, and repair	seafood, meat, liver, eggs, milk and dairy foods, and whole grain products
Copper	needed for iron metabolism and formation of the hemoglobin molecule	seafood, nuts, legumes, and green leafy vegetables
Selenium	acts as an antioxidant, involved with thyroid hormone regulation	seafood, meat, whole grains, fruits, and vegetables

Table 15. Fat-Soluble Vitamins

Vitamin	Key Roles	Food Sources
A	required for vision, growth of bone and teeth, new cell growth, reproduction, and immunity	dark green and yellow fruits and vegetables such as broccoli, spinach, turnip greens, carrots, squash, sweet potatoes, pumpkin, cantaloupe, apricots; eggs; and fortified dairy products such as milk, butter, and cheese
D	promotes absorption and use of calcium and phosphate for healthy bones and teeth	fortified dairy products, such as milk; whole eggs; and salmon; also made by your body when skin is exposed to enough sunlight on a regular basis
E	functions as an antioxidant in fatty tissues and cell membranes, protects red blood cells, and helps prevent destruction of Vitamins A and C	nuts, seeds, avocados, wheat germ, green leafy vegetables, and vegetable oils
K	necessary for normal blood clotting and synthesis of proteins	spinach, lettuce, kale, cabbage, cauliflower, wheat bran, cereals, some fruits, meats, dairy products, and eggs

Table 16. Water-Soluble Vitamins

Vitamin	Key Roles	Food Sources
C	functions as an antioxidant for water soluble components of body tissues; needed for the formation of collagen to hold cells together and for healthy teeth, gums, and blood vessels; improves iron absorption and resistance to infection	fresh vegetables and fruits, such as broccoli, green and red peppers, collard greens, Brussels sprouts, cauliflower, lemon, cabbage, pineapples, strawberries, and citrus fruits
Niacin	needed for energy metabolism, proper digestion, and healthy nervous system	lean meats, poultry, milk, canned salmon, and leafy green vegetables
Thiamine (B1)	needed for energy metabolism and the proper function of the nervous system	whole grains, soybeans, peas, pork, legumes, seeds, and nuts
Riboflavin (B2)	part of enzymes needed for energy metabolism	dairy products, lean meats, poultry, fish, grains, broccoli, asparagus, spinach, and enriched foods
Vitamin B6 (Pyridoxine)	helps make hemoglobin; part of enzymes needed for metabolism of fats and proteins	chicken, fish, pork, whole grains, nuts, and legumes
Folate (Folic Acid)	promotes normal digestion; essential for development of red blood cells	yeast, dark green leafy vegetables, legumes, and some fruits
Vitamin B12	needed for building proteins, red blood cells, and normal function of nervous tissue	yogurt, dairy products, fish, clams, oysters, nonfat dry milk, salmon, and sardines

Table 17. Sources and Roles of Fiber

Type of Fiber	Soluble (dissolves in water)	Insoluble (does not dissolve in water)
Potential Benefits	may help lower blood cholesterol, may help to maintain proper blood sugar levels	helps prevent constipation, hemorrhoids, and diverticulitis
Sources	peas, beans, oats, barley, vegetables, and fruits, especially apples and oranges	whole grain, bran (wheat, oat, and rice), wheat germ, cauliflower, green beans, and celery

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Background on Nutrition

A summary of nutritional information is provided in Appendix 1. The precise nature of the nutrients that people need for a healthy diet is an evolving science and often controversial. Some things, however, are clear.

Vitamins

There are a group of simple chemical compounds that must be part of your diet if you are to be healthy. These were discovered in the 19th century and are called vitamins. The first ones found were amines, and the original name was vital-amines, now shortened to vitamins. The fact that many of them are not amines doesn't matter. Most of the vitamins were discovered because when they are not present in the diet, a deficiency disease occurs.

Vitamin deficiency diseases include scurvy due to lack of Vitamin C, rickets due to lack of Vitamin D, beriberi due to lack of Vitamin B1, and blindness from lack of Vitamin A. As nutritional scientists learned to cure these diseases by adding specific foods, such as citrus for scurvy, the list of vitamins grew and studies were conducted to determine the minimum amount of each specific vitamin needed to prevent the related deficiency disease. Tables 15 and 16 in Appendix 1 include information on dietary sources of each vitamin.

Vitamins are grouped into two categories, water soluble and fat soluble. The water-soluble vitamins, such as Vitamin C and all of the B vitamins, must be eaten regularly, preferably every day, because any vitamins not used by the body are quickly excreted in the urine. Fat-soluble vitamins, on the other hand, are stored in the fat cells in the body and need not be taken every day. The other major difference between the two is that it is possible to get too much of the fat-soluble vitamins, and there are specific disease states that can result from too much of a good thing. Too much Vitamin A can cause liver

damage. Too much Vitamin C, on the other hand, will only cause diarrhea as the body eliminates it.

Beginning in the 1970s, there was a major debate about the optimal amount of vitamins. Some nutrition scientists felt the recommended amounts designed to prevent deficiency disease were not enough for optimal health. Dr. Linus Pauling sparked a craze for taking massive doses of Vitamin C. Other researchers promoted massive amounts of Vitamin E to prevent cardiovascular disease. Vitamin D has been suggested to prevent flu. The debates within the USDA and those within the larger scientific community have not determined to everyone's satisfaction the optimal dose for any of the vitamins. There are well-established minimum and maximum safe doses, but the debate about the best dosage was a very active issue in 1991 and still is today. Vitamins cannot be used for energy, but they are critical for metabolizing the energy-providing nutrients described below.

The three energy-providing nutrients—fats, proteins, and carbohydrates—must be consumed regularly to provide energy for the body to carry out all of its normal functions. In addition to providing fuel, they also serve as important starting materials for the formation of biologically important molecules. It is important for the body to have a constant source of fuel for energy since the brain depends on a constant supply of glucose, a simple sugar. In fact, if glucose is not available, your brain will shut down and death will ensue. Due to this critical need for glucose, your body has the ability to convert carbohydrates, proteins, and fats to glucose. Let us look at these nutrients in a little more detail.

Protein

Proteins are composed of building blocks called amino acids. Some of these are called essential amino acids because the human body can't make them from other amino acids. There are 20 amino acids. Out of those, 9 are essential amino acids and must be supplied from food. It is critical that people eat the proper balance of these essential amino acids. If there is excess of one and a deficiency of another, protein production will stop when the deficient one is used up, and the excess amino acid will be excreted in the urine. Milk, eggs, meats, and fish have just about the right balance of amino acids. Vegetarians and vegans must be careful to include all of the essential amino acids in their diet. When foods that are high in some amino acids and deficient in others

are combined, a complete protein is formed. Common examples include rice and beans, and peanut butter and whole wheat bread. By eating the correct complementary proteins, you can obtain a diet that contains all of the essential amino acids. Proteins can be used to provide energy, but their primary purpose is to act as starting materials for important molecules that can repair and maintain body tissues, such as the cells found in blood, muscles, and bone. Proteins are also used to make antibodies and molecules involved in the immune response. It is important to have fats and carbohydrates readily available in order to spare the breakdown of proteins for energy.

Fats

Fats are a complex collection of molecules made up of long chains of hydrocarbon (containing only carbon and hydrogen atoms) attached in groups of three by oxygen atoms. The key features that distinguish one from another are the length of the chains and the number and position of carbon-carbon double bonds. Saturated fats are those that have no double bonds. Monounsaturated fats have a single double bond in the carbon chain. Polyunsaturated fats have two or more double bonds. Double bonds in nature are normally in the cis-configuration shown in Figure 16 (the hydrogen atoms are next to each other on the same side of the double bond). The alternative is the trans-position (the hydrogen atoms are across from each other on opposite sides of the double bond).

Fats have the highest energy per gram of all of the energy nutrients. They serve as a good source of energy that can be stored in the body for later use. Fats are also important because they readily dissolve fat-soluble vitamins, which are then absorbed by the body. Two specific fats are essential and must be present in the diet, alpha-linolenic and linoleic acid.

Cholesterol is not actually a fat, but it is often bound together with the long hydrocarbons of fatty acids. The amount and types of fat in the diet change the amount of cholesterol made in the body and the way it is transported in the blood. Cholesterol is essential for building biologically important molecules. Examples of such molecules include estrogen and testosterone.

In 1991, many in the scientific community are convinced that saturated fats in the diet are a leading contributing factor in cardiovascular disease. Monounsaturated fats are better, and polyunsaturated fats are best. Most of the hydrocarbons in dietary fats have carbon chains that are either 16 or 18 carbons

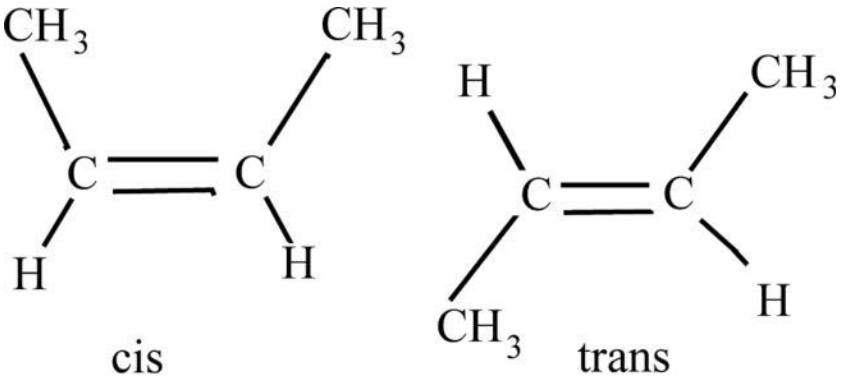

Figure 16. Shapes of Double Bonds

long. The saturated fats are crystalline solids at body temperature and are found in arterial plaques in patients with cardiovascular disease. The presence of even a single double bond can make the fat a liquid in the body. The exceptions are unsaturated fats, where the double bond is in the trans-position as shown in Figure 16. Trans-unsaturated fats are solids like saturated fats. Virtually all trans fats are produced in the chemical process of hydrogenation that is used to make fats last longer and increase the shelf life of foods.

Carbohydrates

Carbohydrates come in two main forms. Simple carbohydrates, such as white potatoes, sugar, and flour are rapidly converted to glucose and lead to a rapid rise in blood glucose levels. This signals specific cells to release insulin and lower blood sugar levels. If there is extra glucose available, the body converts it into fat for storage. The inability of the body to produce insulin in response to blood glucose levels leads to a complicated disease called diabetes. In contrast, complex carbohydrates, such as whole grains, beans, vegetables, and many fruits, are digested very slowly and help maintain reasonable blood glucose levels. Complex carbohydrates also contain fiber. Fiber does not provide energy but is critical in maintaining a properly functioning intestinal system. The lack of fiber in the diet can lead to several painful and debilitating intestinal and bowel diseases.

Table 17 in Appendix 1 lists some foods high in fiber. Scientists don't really know all the reasons you need fiber in your diet.

Minerals

Finally, there are nutrients known as minerals. Some of these minerals, such as calcium, magnesium, sodium, and potassium, are needed in abundance. Some minerals, such as iron, copper, chromium, and manganese, are needed only in very, very small amounts. The minerals in concert with vitamins are used to break down and utilize the energy nutrients. Some minerals, such as iron, are needed for the formation of healthy red blood cells. Some minerals are needed to maintain proper fluid balance in the watery portions of the body. Humans need all of these nutrients to grow, maintain, repair, and reproduce.

The debate over dietary recommendations for Americans will be informed by what is known about the amounts and types of each of these nutrients. Various reference articles provided to the factions will provide arguments that you can use in preparing your testimony to the Congressional Committee.

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Guide to Federal Agencies

UNITED STATES DEPARTMENT OF AGRICULTURE (USDA)

The USDA has programs to support agriculture in all its aspects. These include research on agriculture and farming, crop insurance and disaster assistance programs, import and export programs for farm products, educational programs, supplemental nutrition including food stamps, environmental conservation, water resources, fire prevention and control, and nutritional research and education. The USDA inspects all meat and dairy products and facilities for processing meat and dairy. The Secretary of Agriculture and all Director and Assistant Director positions are political appointees. All others are professional civil service employees.

DEPARTMENT OF HEALTH AND HUMAN SERVICES (DHHS)

The DHHS is the primary agency dealing with human health. It manages the Medicare and Medicaid programs. It includes the Food and Drug Administration and the Centers for Disease Control. The Secretary of DHHS and all Director and Assistant Director positions are political appointees. All others are professional civil service employees.

CENTERS FOR DISEASE CONTROL (CDC)

The CDC has numerous centers dealing with infectious diseases, public health, occupational health and safety, health statistics, surveillance for diseases of all types, environmental health, toxic substances monitoring, etc. It collects health data and monitors disease outbreaks including foodborne illness.

FOOD AND DRUG ADMINISTRATION (FDA)

The FDA approves all drugs for humans and animals, cosmetics, medical devices, and food additives. It monitors food ingredients, packaging, and labeling except food containing meat (the FDA controls frozen cheese pizza but not frozen pepperoni pizza, which is monitored by the USDA).

Food Fight is set during a 1991 Congressional hearing that evaluated the USDA's development of the Food Pyramid, a document that angered various agribusiness groups and some nutrition experts. This Open Access Reacting Game can be used in food and nutrition general education science courses and introductory chemistry and biology courses. *Food Fight* has also been used in courses that explore graphic representations of data and in public policy courses because it deals with conflicts of interest in government policy and the role of lobbyists and the press in those debates.

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