HELP YOURSELF TO A HEALTHY HEART

A Document-based Case Study in Making Healthy Decisions from Evidence

Nathan Nebbe, Waterloo CSD
Rebecca Steinlage, Benton Schools
Summer 2014
INTRODUCTION

About 25% of deaths in the United States are due to heart disease. It’s the leading cause of death in both men and women, and kills hundreds of thousands of people every year. For a long time, doctors and researchers thought that high fat diets were the cause of heart attacks and cardiovascular disease. Today, we know that fats aren’t the only culprit—in fact, there are many fats our bodies need to work correctly—and that genetics, activity and other factors like smoking play a role in heart health.

As you learn about different types of fats and their roles in organisms, you will also be asked to make a decision using some information given to you. Some of this information may be factual; some may be based on opinion or emotion. You need to use this information and some critical thinking skills to help you make your decision.

You will be placing yourself into a pretty realistic role—a typical hungry teenager coming home after soccer. You need to make a decision about what you’re going to eat, but it’s not as simple as finding the first food you can and stuffing it in your face. Read the scenario below, and use the included documents to make your informed decision. Then, create a food journal entry that tells which food you chose, how much of it you’d really eat, and what factors led to that decision.

There is no right or wrong answer here; you will be assessed based on how well you used or cited evidence (the included information) to make and defend your decision. Evidence can be from the scenario given as well as the supportive documents (attached). Hungry? Let’s get started.

SCENARIO

It’s been almost a year since your dad died of a heart attack at age 45. You’ve been thinking about him a lot, and it’s been hard adjusting to life without him. He had a mild heart attack a couple of years before he died, and he did change things to try to prevent another one, but sadly he still had cardiovascular issues that contributed to his death.

Your mom has been pretty vigilant about the family’s health, because it turns out that your paternal grandpa (Dad’s dad) also died young of a heart attack. In fact, he died before you were even born. So at your last sports physical, you sat down with your doctor and talked about how scared you were that you would follow in your family’s footsteps. You’re a pretty active and healthy kid over all (so says your doctor); you play soccer and basketball, and run cross country in the fall. But you’re wondering what you can do to live healthier so your mom doesn’t have to worry about losing you too soon. Your doctor recommended a “baseline” consultation with the clinic’s dietitian, and she suggested you journal your food consumption for a month, to get an idea of what you eat, and how much. She recommended eating what you usually do, in the usual amounts, and after a month she’d visit with you again and talk about any changes that you might need to make.

You’ve been learning about lipids in biology and how they are used in the body, and how different chemical structures give them slightly different properties, and a lot of that has connected to what your doctor and dietitian have said. As you walk into the kitchen after school, you hook your bookbag strap over the chair and take out your biology book and food journal. You have some biology homework to do, and flip the book open to the page that just so happens to mention different kinds of lipids. But before you get started, you have a bigger problem—you’re hungry. So, you go to the cupboard to see what’s still there before mom gets around to throwing the junk food out. There’s 2 kinds of peanut butter (the “normal stuff” and some “natural” stuff that has oily gunk on top of it), Nutella, Pop Tarts, some yogurt covered blueberries, Easy Mac and some Doritos. You help yourself to some of the food, and write it down in your journal.
What are you going to eat? You need to choose one of the given foods and write a food journal entry for it. Your journal entry will be graded using the rubric below. “Unique citations”=from different parts of different documents.

<table>
<thead>
<tr>
<th>Points</th>
<th>Authenticity</th>
<th>Journal Entry Information</th>
<th>Journal Entry Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>• Hand written journal page&lt;br&gt;• Includes calculations and/or other authentic details.&lt;br&gt;• Looks like real journaling or documentation.&lt;br&gt;• Includes date and time.</td>
<td>Includes:&lt;br&gt;• Food name or type (from documents provided)&lt;br&gt;• Amount of food consumed&lt;br&gt;• Amounts of total fat, saturated fat and unsaturated fat as well as trans fat and cholesterol consumed&lt;br&gt;• Percentages of above fats consumed (out of % Daily Value from Nutrition Facts label)</td>
<td>• Also written in journal entry&lt;br&gt;• Contains 5 reasons why student chose the food s/he did.&lt;br&gt;• Each reason has a unique citation from one of the documents given, or the scenario itself</td>
</tr>
<tr>
<td>4</td>
<td>Missing one item above</td>
<td>Missing one item above</td>
<td>4 reasons, or 5 reasons, some with duplicate citations</td>
</tr>
<tr>
<td>3</td>
<td>Missing two items above</td>
<td>Missing two items above</td>
<td>3 reasons, OR and citations are duplicates and/or one citation is missing</td>
</tr>
<tr>
<td>2</td>
<td>Missing three items above</td>
<td>Missing three items above</td>
<td>2 reasons, and/or lacking 3 or more unique citations</td>
</tr>
<tr>
<td>1</td>
<td>Journal page is illegible, typed, does not appear authentic, does not have date or time, etc.</td>
<td>Food is not from documents provided, or only name is listed and/or no indications of amounts of various fats consumed or percentages</td>
<td>Only 1 or 2 reasons, and/or no unique citations, or no citations.</td>
</tr>
</tbody>
</table>

15 Total Points
Dietary fats: Know which types to choose

By Mayo Clinic Staff

Most foods contain several different kinds of fat, and some are better for your health than others. You don't need to eliminate all fat from your diet. In fact, some fats actually help promote good health. But it's wise to choose the healthier types of dietary fat and then enjoy them — in moderation.

There are numerous types of fat. Your body makes its own fat from taking in excess calories. Fats found in foods you eat are known as dietary fat. Dietary fat is a macronutrient that provides energy for your body. It is essential to your health because it supports a number of your body's functions.

But there is a dark side to fat. Fat is high in calories and small amounts can add up quickly. If you eat more calories than you need, you will gain weight.

The concern with some types of dietary fat (and their cousin cholesterol) is that they are thought to play a role in cardiovascular disease and type 2 diabetes.

A growing body of research suggests that when it comes to dietary fat, you should focus on eating healthy fats and avoiding unhealthy fats.

There are two main types of potentially harmful dietary fat — fat that is mostly saturated and fat that contains trans fat.

- **Saturated fat.** This fat comes mainly from animal sources, such as red meat, poultry and full-fat dairy products. Saturated fat raises total blood cholesterol levels and low-density lipoprotein (LDL) cholesterol levels, which can increase your risk of cardiovascular disease. Saturated fat may also increase your risk of type 2 diabetes.

Most fats that have a high percentage of saturated fat or that contain trans fat are solid at room temperature. Because of this, they're typically referred to as solid fats. They include beef fat, pork fat, butter, shortening and stick margarine.

The types of potentially helpful dietary fat are mostly unsaturated:

- **Mono- and polyunsaturated fat.** These fats are found in a variety of plant-based foods and oils. Studies show that eating foods rich in mono- and polyunsaturated fats improves blood cholesterol levels, which can decrease your risk of heart disease.
Cholesterol (the Bad Cholesterol) and Where It Lurks

Burgers. Bacon. Cheese fries. What do they have in common (besides being some people's idea of delicious)? They're all high in cholesterol. So what is cholesterol?

Cholesterol is a waxy substance produced by the liver and found in certain foods. It is needed by our bodies to make vitamin D and many hormones, to build healthy cell membranes, and to create bile salts that help to digest fat. Your liver naturally produces about 1,000 milligrams of cholesterol a day, which is enough cholesterol so that if you never touched another cheese fry, you'd be absolutely fine (in fact, better than fine).

It's hard to avoid excess cholesterol, however, because so many foods, especially those we tend to like to eat, contain it. Cholesterol is found in foods from animal sources. This means that eggs, meats, and whole-fat dairy products (including milk, cheese, and ice cream) are loaded with cholesterol — and vegetables, fruits, and grains contain none.

The problem with cholesterol is that too much cholesterol in the body can lead to serious problems like heart attacks and other types of heart disease.

Many factors can contribute to high cholesterol but the good news is that there are things you can do to control them. These include: eating a healthy diet (make sure you eat seven servings of fruits and vegetables each day) and exercise (at least 30 minutes 3 to 4 times a week).

Dangers of High Cholesterol Levels

When you have too much cholesterol, it can be dangerous to your health. When cholesterol levels are high, cholesterol is deposited on the walls of arteries and forms a hard substance called plaque. Over time, plaque causes the arteries to become narrower, decreasing blood flow, and causing hardening of the arteries (formally called atherosclerosis). An individual with hardening of the arteries is at greater risk of a heart attack or stroke.

Arterial hardening can also block blood flow to other vital organs, including the kidneys and intestines. This is why it's so important to start paying attention to cholesterol levels as a teen — you can delay or prevent serious health problems in the future.

Factors that lead to high cholesterol include being overweight, heredity (if there is a history of heart disease in your family), and diet (avoid foods, like those cheese fries, high in saturated fats and cholesterol). In addition, the risk of high cholesterol increases as you get older.
### Saturated and Unsaturated Fats (Melting Points and Molecular Structure)

Melting points for common oils used for making food.

<table>
<thead>
<tr>
<th>Type of Oil</th>
<th>Melting Temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lard (animal)</td>
<td>195</td>
</tr>
<tr>
<td>Palm Oil</td>
<td>95</td>
</tr>
<tr>
<td>Butter (animal)</td>
<td>93</td>
</tr>
<tr>
<td>*Margarine</td>
<td>93-109</td>
</tr>
<tr>
<td>Coconut Oil</td>
<td>77</td>
</tr>
<tr>
<td>Peanut Oil</td>
<td>37</td>
</tr>
<tr>
<td>Olive Oil</td>
<td>21</td>
</tr>
<tr>
<td>Canola Oil</td>
<td>14</td>
</tr>
<tr>
<td>Corn Oil</td>
<td>12</td>
</tr>
<tr>
<td>Soybean Oil</td>
<td>3</td>
</tr>
<tr>
<td>Sunflower Oil</td>
<td>1</td>
</tr>
</tbody>
</table>

A saturated fatty acid is fully hydrogenated. Examples of oils made up mostly of saturated fatty acids are lard and butter.

An unsaturated fatty acid — note the kinks in the molecules where there are carbon-carbon double bonds. Examples of oils made up mostly of unsaturated fatty acids are corn and soybean oils.
Mrs. Jane Smith  
3955 Stark Dr.  
Winterfell, IA 53452

Mrs. Smith:

Enclosed per your request are your late husband’s last blood lipid panel results. My staff and I are always available to visit with you and your family about dietary changes, and I hope the food journaling is going well.

If you have any questions, feel free to contact me via email at jpinkman@mercyhospital.org, or call my office at (563) 332-3577.

Best wishes,

Jessica Pinkman, R.D.  
Mercy Hospital  
Winterfell, IA

<table>
<thead>
<tr>
<th>TESTS</th>
<th>RESULT</th>
<th>FLAG</th>
<th>UNITS</th>
<th>REFERENCE INTERVAL</th>
<th>LAB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lipids</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cholesterol, Total</td>
<td>210</td>
<td>High</td>
<td>mg/dL</td>
<td>100-199</td>
<td>01</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>236</td>
<td>High</td>
<td>mg/dL</td>
<td>0-149</td>
<td>01</td>
</tr>
<tr>
<td>HDL Cholesterol</td>
<td>36</td>
<td>Low</td>
<td>mg/dL</td>
<td>&gt;39</td>
<td>01</td>
</tr>
</tbody>
</table>

According to ATP-III Guidelines, HDL-C >59 mg/dL is considered a negative risk factor for CHD.

LDL Cholesterol Calc  127  High  mg/dL  0-99  01

Comment

If initial LDL-cholesterol result is >100 mg/dL, assess for risk factors.

T. Chol/HDL Ratio  5.8  High  ratio units  0.0-5.0  01

Estimated CHD Risk  1.2  High  times avg.  0.0-1.0  01

The CHD Risk is based on the T. Chol/HDL ratio. Other factors affect CHD Risk such as hypertension, smoking, diabetes, severe obesity, and family history of premature CHD.
### Nutella - Serving Size: 2 tablespoons

<table>
<thead>
<tr>
<th>Nutrition Facts</th>
<th>Amount/Serving</th>
<th>% Daily Value</th>
<th>Amount/Serving</th>
<th>% Daily Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calories</td>
<td>160</td>
<td></td>
<td>Calories</td>
<td></td>
</tr>
<tr>
<td>Fat</td>
<td>15g</td>
<td>2%</td>
<td>Unsaturated Fats</td>
<td>2g</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>2g</td>
<td>1%</td>
<td>Trans Fat</td>
<td>0g</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>0mg</td>
<td></td>
<td>Sodium</td>
<td>100mg</td>
</tr>
<tr>
<td>Sodium</td>
<td>70mg</td>
<td>3%</td>
<td>Total Carbohydrate</td>
<td>20g</td>
</tr>
<tr>
<td>Total Carbohydrate</td>
<td>20g</td>
<td>7%</td>
<td>Protein</td>
<td>8g</td>
</tr>
<tr>
<td>Dietary Fiber</td>
<td>5g</td>
<td>2%</td>
<td>Sugars</td>
<td>1g</td>
</tr>
<tr>
<td>Protein</td>
<td>8g</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vitamin A</td>
<td>0%</td>
<td></td>
<td>Vitamin C</td>
<td>0%</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>0%</td>
<td></td>
<td>Calcium</td>
<td>1%</td>
</tr>
<tr>
<td>Iron</td>
<td>0%</td>
<td></td>
<td></td>
<td>0%</td>
</tr>
</tbody>
</table>

### Nacho Cheese Doritos

- Serving Size: 11 Chips

### Skippy Peanut Butter

- Serving Size: 2 tablespoons

### Welch’s Yogurt Covered Blueberries

- Serving Size: 30 grams (2 per bag)

### Natural Peanut Butter

- Serving Size: 2 tablespoons

### Cherry Poptarts

- Serving Size: 1 pastry
Document Analysis Prompts

1. Please give a brief description of the document.

2. Why was the document written?

3. Who wrote the document or what was the source of the document?

4. What are the important points of this document? What does it show?
   
   a. Please integrate the information found in the document to reach a conclusion (or conclusions) as to the overall meaning of the document.
   
   b. How does the document impact your understanding of food and nutrition?

5. How does the document relate to what we have been learning in class?

6. How might this document be relevant to nutrition; and specifically to your choice of a healthy snack or meal? How might it inform your choice?
The following are suggestions for evaluating student understanding and reasoning for the concepts related to this case. The model response examples are not written to be perfect answers but samples of the type of reasoning you can perhaps expect. Feel free to adapt or create your own assessment template for this case.

**Model Response Example: Document A (Mayo Clinic “website”)**

Eating too many saturated fats is not good for my health. I need to eat fewer animal products and increase my consumption of vegetable oils in order to be healthier. This is a webpage was created by the Mayo Clinic, which is a very good hospital.

**Note to Teacher**

**Superior Critical Thinker:** the student will recognize that there are healthy fats and that they should be part of a healthy diet. He/she will be able to connect the type of fat with its source and, therefore, its impact on his/her body. Since this is Document A, it is not yet required that the student able to connect fatty acid structure and melting point to functions in the body (e.g. plaque formation and cell membrane structure). Superior critical thinkers, however, might already be able to do this. The student will be able to recognize the reliability of the information.

**Proficient Critical Thinker:** the student will recognize that saturated fats are bad for his/her health and unsaturated fats are good. The student may not connect health effects with the source of fat or the type of fat with its source, though should be able to, at least, associate two of the three elements at the same time. The student will be able to recognize the reliability of the information.

**Emerging Critical Thinker:** the student will mainly recognize fats as “bad” or “unhealthy” and may not recognize the source of information as reliable. The student may struggle to distinguish between types of fats.

**Model Response Example: Document B (a doctor’s office educational pamphlet)**

Bad cholesterol must come from eating saturated fats (as stated in Document A). So, the more saturated fats I eat results in the building up of plaque in my arteries – causing my arteries to be less flexible. My father had hardening of the arteries, which led to his heart attack. By eating fewer saturated fats, fats from animals, I should be able to lower my risk of hardening of the arteries and heart attack. When I pick something to eat, I should try to find out how much saturated fat and cholesterol are in it.

**Note to Teacher**

**Superior Critical Thinker:** the student will be able to connect cholesterol with hardening of the arteries (arteriosclerosis), the consumption of saturated fats, and the health of his/her heart. The student will also be able to infer the reduction of cholesterol with the consumption of unsaturated fats, which reduce plaque accumulation.

**Proficient Critical Thinker:** The student will be able to connect cholesterol with hardening of the arteries, the consumption of saturated fats, and the health of his/her heart; however, the student will not infer the reduction of cholesterol with the consumption of unsaturated fats.

**Emerging Critical Thinker:** The student will recognize that cholesterol is bad for his/her health. They will not associate it with hardening of the arteries and the consumption of saturated fats.

**Model Response Example: Document C (from a biology textbook)**

From the drawings, I see that saturated fats are more tightly packed together than unsaturated fats. I believe this is because of the carbon-carbon double bonds in the fatty acids that make up fats and oils. When I compare the structures of saturated fats and unsaturated fats to different types of oils and there melting points, I see that animal oils are solid at a normal temperature – and the plant oils are not. So, the tight layering of the fatty acids is harder for my body to break down. The plant oils are not packed tightly and thus are more easily broken down by my body. In fact, the plant fats, due to their molecular structures, help to clean plaque out of my arteries. I need to eat oils that my body can more easily process and do encourage plaque to grow.
**Note to Teacher**

**Superior Critical Thinker:** the student will be able to connect molecular structure with oil melting point and how difficult it is for the body to break down the oil. He/she will be able to demonstrate the connection between impact on the body and molecular structure (degree of hydrogenation). He/she will also be able to connect type of oil and degree of hydrogenation with the source of the fat. This type of student will note how vegetable fat is transformed when hydrogenated. The student will be able to connect melting point, degree of hydrogenation, and molecular structure with cholesterol level.

**Proficient Critical Thinker:** The student will be able to connect saturated and unsaturated oils with melting point. The student will be able to recognize the difference between the molecular structures of unsaturated and saturated though may not understand how the arrangement of those molecules is related to degree of hydrogenation.

**Emerging Critical Thinker:** The student will be able to associate vegetable oils (and thus unsaturated fats) with lower melting points and animal oils with saturated fats and higher melting points. The student may have issues connecting molecular structure (which may prove difficult as a concept on its own) and degree of hydrogenation, with melting point.

**Model Response Example: Document D (blood lipid panel/letter)**

This is a blood test report from a doctor’s office. I see that the patient has high readings of triglycerides and cholesterol. Triglycerides are the main constituent of oils (plant and animal) and are an indicator of risk of stroke. The cholesterol reading indicates that there is plaque building up in the arteries, resulting in hardening of the arteries. This is connected with a person’s risk of heart attack. The cholesterol reading is even more worrying because the bad cholesterol is high while the good cholesterol (which decreases plaque build up) is low. The registered dietician who sent this report indicates that the person needs to change her diet and talk with her doctor about medication. It is possible that some of the high cholesterol reading and risk of heart attack is due to genetics and not just about the person’s diet. The profile in this report may be like my father’s or grandpa’s were.

**Note to Teacher**

**Superior Critical Thinker:** The student will be able to read and interpret the salient points in the chart and draw conclusions from triglyceride and cholesterol readings. They will be able to connect risks of stroke and heart disease with the cholesterol and triglyceride readings. The student will also be able to differentiate between good and bad cholesterol. They might also make connections between grandfather/dad/child and genetic tendencies, and use that line of reasoning to make a better snacking choice. They may recognize or argue that the panel represents one test with little context and the numbers might vary under different circumstances.

**Proficient Critical Thinker:** The student will be able to summarize at least some of the data from the panel, though may do so with difficulty. They may not grasp the distinction between good and bad cholesterol but should connect hardening of the arteries with the cholesterol reading. The student may not make the connection between triglycerides and stroke. The student will probably not make the association between genetics, cholesterol and triglyceride readings, and a person’s likelihood of developing atherosclerosis.

**Emerging Critical Thinker:** The student will probably struggle to read and understand the chart without help. They will be able to understand cholesterol as something that needs to be monitored but may not understand that cholesterol comes in different forms - and one is generally healthy while the other isn’t. They will likely not recognize the role genetics plays in atherosclerosis and stroke; and may have difficulty understanding what a triglyceride is and how it affects your health.

**Model Response Example: Document E (nutrition labels)**

When I choose something to eat, I should check the nutritional label or get nutritional information. In order to pick the best option for my heart, I need to look at saturated fats, cholesterol and serving size. The serving size for Doritos is 11 chips. I eat eleven chips in two handfuls. So, while Doritos does not look like a bad choice, the amount of saturated fats I would consume would be much higher because I would eat a lot more than just 11. The same is true for Kraft Mac and Cheese. Would one serving be enough to make me not hungry? Would I have to eat something else? It is important to think about how filling a food is. Of our possibilities,
the natural peanut butter is probably the best choice. It is mostly unsaturated fats, it is plant oil, plus it has no cholesterol (good for my heart) and lots of protein, which is important because I lift weights.

**Note to Teacher**

**Superior Critical Thinker:** The student will demonstrate that he/she can take what he/she has learned and apply it by analyzing a food’s nutritional information – resulting in an advantageous and supportable, based on facts, decision. The student will not only use the information on saturated and unsaturated fats and cholesterol, but will also be able to connect those concepts with serving size and how many servings they actually eat in a “sitting.” They will make their snacking decision based on all of these factors.

**Proficient Critical Thinker:** The student will note cholesterol, saturated fat, and unsaturated fat but may not factor in serving size into their decision-calculation. Their decision will be based on information but may not take into account how much they really eat in a sitting. This will affect the justification of their final snacking decision.

**Emergent Critical Thinker:** This student might be able to differentiate among saturated fats, unsaturated fats, and cholesterol but might have difficulties integrating the concept of serving size into their decision-calculation.