

The Mediterranean Diet and the Effects on Primary and Secondary Prevention of Heart
Disease

by

Kayla Elyse Minyard

Honors Thesis

Appalachian State University

Submitted to The Honors College

in partial fulfillment of the requirements for the degree of

Bachelor of Science

August, 2016

Approved by:

Martin Root, Ph.D., Thesis Director

Jeanne Dubino, Ph.D., Second Reader

Ted Zerucha, Ph.D., Interim Director, The Honors College

Table of Contents

Abstract.....	2
Going Against the Grain.....	3
History of the Mediterranean.....	5
The Rise of the Mediterranean Diet.....	6
The Contemporary Mediterranean Diet.....	10
Cereals and Tubers.....	12
Fruits and Vegetables.....	12
Olive Oil.....	13
Fish and Seafood.....	14
Poultry, Eggs, and Dairy.....	14
Meats and Sweets.....	15
Wine.....	15
Cardiovascular Disease in America.....	16
Cardiovascular Disease in the Mediterranean Region.....	17
Effects of the Mediterranean Diet.....	19
Primary Prevention.....	19
Secondary Prevention.....	23
Beyond the Fork.....	28
Implementing a Mediterranean Diet.....	30
Conclusion.....	33
References.....	35

Abstract

The Mediterranean diet has been held in high regards for its benefits in treating many health-related diseases, including heart disease. Influenced by the Mediterranean region, this diet incorporates the traditional diets of those from Greece, and Italy, and was developed from research in what is known as the Seven Countries Study by an American scientist named Ancel Keys. Being publicized in the United States as a diet consisting of mainly fruits, vegetables, grains, legumes, red wine and olive oil, it consists of moderate amounts of fish in the diet and even fewer recommended dairy, egg, red meat and sweets options. Because cardiovascular disease is the leading cause of death in the United States, the Seven Countries Study found the Mediterranean countries to be lower in rates of cardiovascular disease in correlation with their diets.

Primary and secondary preventative research has been done regarding the effects of the Mediterranean diet on heart disease of different types. Compiled results have found the Mediterranean diet decreases the incidence of cardiovascular disease events, risk of heart failure and death due to heart failure, and chances of myocardial infarction and ischemic stroke as a primary prevention. In secondary preventative studies, results have shown the diet to have a 50 to 70 percent decreased risk of repeated heart disease, decreased blood leukocyte count, and increased high-density lipoprotein and baseline brachial artery diameter.

As the Mediterranean diet is not only associated with food, it is also necessary to be implemented as a lifestyle change, incorporating social interactions and physical activity to encourage receiving all of the benefits the Mediterranean diet has to offer.

Going Against the Grain

Growing up the epicenter of a western diet, I was one of the many consumed by the social norms and diet of a Texas upbringing. Living out most of my days surrounded by steak, barbeque, creamy vegetable dishes, I was at a disadvantage as to knowing how to live out a healthy and nutritious lifestyle. Sure, I knew vegetables and fruits were healthy, and I grew up knowing I had to eat everything on my plate if I wanted dessert. But my whole life was centered on food. One specific moment I reflect back on is getting snacks at this one gas station on my way home from camp. My mom worked at a day camp during the summer teaching horseback riding for years, and I spent my summers there with her. Every Friday, we would stop after camp at a gas station, and I was allowed two snacks for the short ride home. I looked forward to that every Friday with my mom, and deciding which of the unhealthiest snacks I could get that would last me until the next Friday. Whether we were celebrating a birthday, going out to lunch after church, stopping at gas stations, or simply eating when the clock told us to, my life revolved around using food in almost every aspect of my life.

The main reason that food had so much influence on my life is that for most families growing up in the west, social gatherings almost always followed with food. Be it potlucks, grilling, putting on a dinner or a luncheon, and going out to eat—just about any occasion. My family went to my grandparents' house at least once a week. And every time we went over, there was always food—steak, leftover barbeque, creamy broccoli salad, Frito Lays chips, my Mimi's famous baked spaghetti, green bean casserole, and so on. At the time, I didn't know it had such an influence on my life until

we moved to North Carolina. Being away from my extended family, we were pulled from the social norm of celebrating being in the presence of a large family with food.

It was not until my sophomore year of college that I had an epiphany, forever changing my perspective of diet and health. I knew exercising was healthy for you, and I was aware to some extent about the distinction between nutritious foods and harmful foods. I was home for the summer and I was thinking about what I wanted to do with my life. At this point, I hadn't declared my major. I was thinking about raising a family of my own one day and wondering how my mom was able to do it all. I considered my own life and how I grew up and started to contemplate how difficult it was to cook and provide for a family of five. My stream of consciousness led me to, what I believed, to be my own personal epiphany. It was in that moment that I realized I wanted a family eventually to care and provide for, but I wanted to equip myself with the knowledge to nourish them as best I could. Food has been an overwhelming factor in my life, as I'm sure most people can relate, and I took it upon myself to endow my education in college to nutrition.

I was awed by the all of the material and knowledge my professors had to share. I started to realize the correlation between the foods that someone eats and the effects it has on their health. My interest in using food and diet as a preventative medicine grew, and I found myself shadowing a Registered Dietitian one summer who volunteered her time at the local YMCA. She facilitated my further excitement of nutrition by introducing me to the Mediterranean Diet, a model she used in her practice. Working closely with cardiac rehab patients in a cardiac rehabilitation program, she came across many patients and individuals who had experienced some form of heart

disease. She presented what the Mediterranean Diet was and implied the health benefits that the Mediterranean diet had on cardiac rehabilitation patients. She introduced me to the idea of the Mediterranean Diet and the studies that have been done that have shown to significantly reduce risk factors and symptoms of those who have experienced cardiac health implications. With that experience, I have wanted to learn more about the ways in which the Mediterranean Diet acts as a lifestyle change to better the health of those who have experienced cardiovascular diseases, what all it includes, its effects, and where exactly it stems from.

History of the Mediterranean Diet

The main origins of the “Mediterranean Diet” have become lost in time, as it has become a historical clashing and exchange of cultures as well as shaped by historical events and takeovers by many different civilizations. The ancient Roman tradition, based on a Greek model, is identified in bread, wine, and oil products. These are a symbol of its rural and agricultural culture, accompanied by sheep cheese; vegetables including leeks, mallow, lettuce, chicory, and mushrooms; little meat, and a strong inclination for fish and seafood.

Not only have the different civilizations influenced the Mediterranean cuisine, but also the hierarchy of social classes have contributed and shaped the food culture. Those who came from wealth in the Roman Empire represented their prosperity in the types of foods they ate. Fresh fish either fried in olive oil or grilled, as well as seafood and oysters was a display of wealth among the classes. On the other end, the slaves of Rome consumed what was known as “poor food,” consisting of bread, half of a pound of olives and olive oil per month, some salted fish, and rarely any meat. The role of cereals

was also well known to the poor classes as it was used as a way of reducing hunger and had the ability to fill empty bellies. The important cereals that were used not only by the poor classes of Rome, but of the classes of poor populations spread throughout the Mediterranean included bread, polenta, couscous, soups, paella, and pasta all as different means to consume cereals.

It was not until later that the Roman tradition met an imported style of food from a culture of Germanic nomads whom lived in close accord with the forest. They utilized hunting, farming and gathering to produce most of their food sources and raised pigs for consumption, grew vegetables in gardens close to homes, and used grains to make beer.

Soon after, a third tradition was introduced to the Mediterranean food culture, which gave a boost to a renewal of agriculture. The Islamic culture, coming from the southern shores of the Mediterranean, brought a variety of plant species that were sold at high prices and therefore only sought after by the wealthier classes. Sugar cane, rice, citrus, eggplant, spinach, spices, rosewater, oranges, lemons, almonds, and pomegranates were among some of the expensive foods that were introduced.

Another important event was the European discovery of the Americas. This discovery introduced the world to potatoes, tomatoes, corn, peppers, chili, and a variety of different beans. Later, the tomato would take on an important role in the Mediterranean diet as a crucial symbol of its cuisine.

The Rise of the Mediterranean Diet

The Mediterranean Diet, as many commonly know it today, can be attributed to an American scientist named Ancel Keys who discovered the health benefits that the

Mediterranean Diet has to offer. In pursuance of the question of interest at the time of how dietary fat influences blood cholesterol, Keys traveled to the poor towns of southern Italy in the 1950s, and to his surprise, discovered that the population there was much healthier than the wealthy citizens in New York. From this observation, Keys speculated that diet was the cause and began to focus on the population's cultural foods that made up their normal diet. This discovery led to Keys's famous "Seven Countries Study" where a large cross-cultural study was conducted on sixteen cohorts from Finland, Holland, Italy, United States, Greece, Japan, and Yugoslavia in order to document relationships between lifestyles, nutrition, and cardiovascular diseases between the differing populations.

It was discovered that Finland and the Netherlands showed a diet trend high in milk, potatoes, edible fats, and sugar products. The United States had a high consumption of fruit, meat, and pastries while Italy was high in cereals and alcoholic beverages. Yugoslavia had high bread consumption, Greece was portrayed as having a high intake of olive oil and fruit, and Japan had a high rice, fish, and soy diet. While each country exhibited a different food trend, it was found that those populations that had a Mediterranean-based diet showed a low risk of coronary heart disease despite cholesterol levels similar to those in northern Europe and the US. While the major food consumption patterns observed between these differing cohorts have decreased, the relative position of each of the cohorts in their coronary heart disease risk has remained relatively the same (Kromhout, 1989).

Although each country that the contemporary Mediterranean diet is based on today do not each exhibit all key food elements that make up the "Americanized"

Mediterranean diet, they each act like a puzzle piece that makes up the bigger picture at large. It was through his research and his cross-cultural study that Keys popularized the Mediterranean diet in America, introducing his findings between cardiovascular disease rates and diet. Ultimately, his research led to more studies interested in observing the connection between different dietary fats and their relation to serum cholesterol and risk of cardiovascular disease.

The Seven Countries Study was the first study to direct attention toward the causes of population rates of disease while documenting differences in the diet. In particular, the amount of saturated fat and serum cholesterol levels and diet were accounted for across each cohort studied to predict present and future population rates of coronary heart disease.

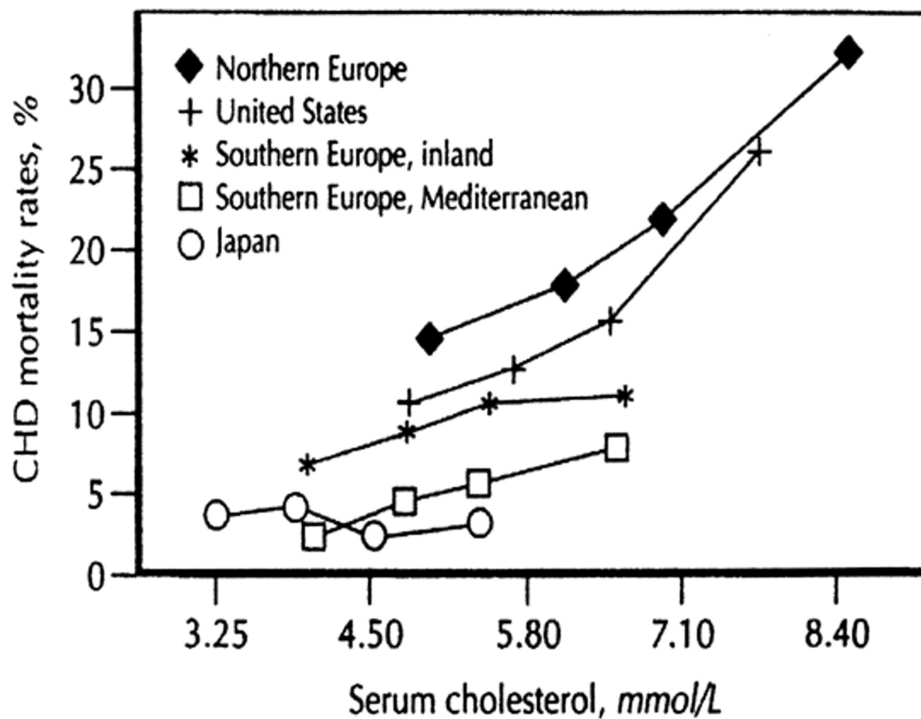


Figure 1. Rate of mortality due to CHD per quartile of serum cholesterol from cohorts in the Seven Countries Study (Lorgeril et al., 2002).

The above graph exhibits the rate of mortality due to coronary heart disease in correlation to serum cholesterol levels from cohorts in the Seven Countries Study. It is interesting to note that Northern Europe has the highest serum cholesterol levels out of all of the groups and some of the highest incidences of coronary heart disease deaths while Japan stays stagnant with some of the lowest levels of both serum cholesterol and coronary heart disease mortality rates. Interestingly enough, in contrast to what the data represents as the correlation between increasing serum cholesterol and increasing coronary heart disease mortality rates, Japan's data illustrates some divergent information. Even as their cholesterol levels rise, their coronary heart disease mortality rates remain the same, while their highest serum cholesterol level is almost Northern Europe's lowest cholesterol level. This could suggest some alternative variables in each site's diet that also have an effect on coronary heart disease. The graph is a visual representation of the correlation Keys discovered between cholesterol and heart disease, which sparked further endeavors and studies into the association between cholesterol and heart disease, or diet and health in general.

In 1980, after Keys published his *A Multivariate Analysis of Death and Coronary Heart Disease*, more research got underway, focusing on the Mediterranean diet typical to those of Greece, southern Italy, and other southern European regions. His famous study led to the popularization of the diet. Shortly before his work was published, his wife, wrote *Eat Well and Stay Well the Mediterranean Way* in 1975. As nutrition was just as new a scientific topic as it is today, any new nutrition findings are glamorized points

of interest in any media source. Published works also helped spread the word of the Mediterranean diet and contributed to the popularization. Keys was also featured on the cover of *Time* magazine on the January 13, 1961 issue because of his influence on dietary science, spreading his name and his work throughout America.

Interestingly enough Keys life came to an end just before his 101st birthday living off the coast of southwest Italy, where he spent the last 28 years of his life. He continued his dedicated work to the Seven Countries Study right up until his death. His famous work has contributed to the important discovery of the different dietary fatty acids and their effects on serum cholesterol levels, contributing to cardiovascular disease.

The Contemporary Mediterranean Diet

It is important to note that the Mediterranean Diet is not characterized as a brand-new “fad diet” that is used to promote quick and easy weight-loss. To be exact, the word “diet” refers to the kinds of food that a person, animal, or community habitually eats. Unfortunately, society has come to deem the word as a special course of food that one restricts themselves to in order to lose weight. While the Mediterranean Diet can promote weight loss, its main focus is to promote an alternative to a healthier lifestyle of eating.

The Mediterranean Diet Pyramid, was created in 1993 as an alternate pyramid used to group foods that characterize the Mediterranean Diet. It was created shortly after the United States Department of Agriculture (USDA) introduced The Food Guide Pyramid in 1992; however rather than being created by the USDA, it was made by the Oldways Preservation and Exchange Trust, the Harvard School of Public Health, and the

European Office of the World Health Organization. The pyramid was modeled on the typical dietary patterns of the people from the Greek island of Crete and was developed after the Seven Countries Study discovered correlations between the diet and health benefits the Mediterranean cuisine had to offer. Overall the island of Crete had a diet high in fat, and yet had the lowest cardiovascular mortality rate, causing an interest in the diet of those living in the Mediterranean region.

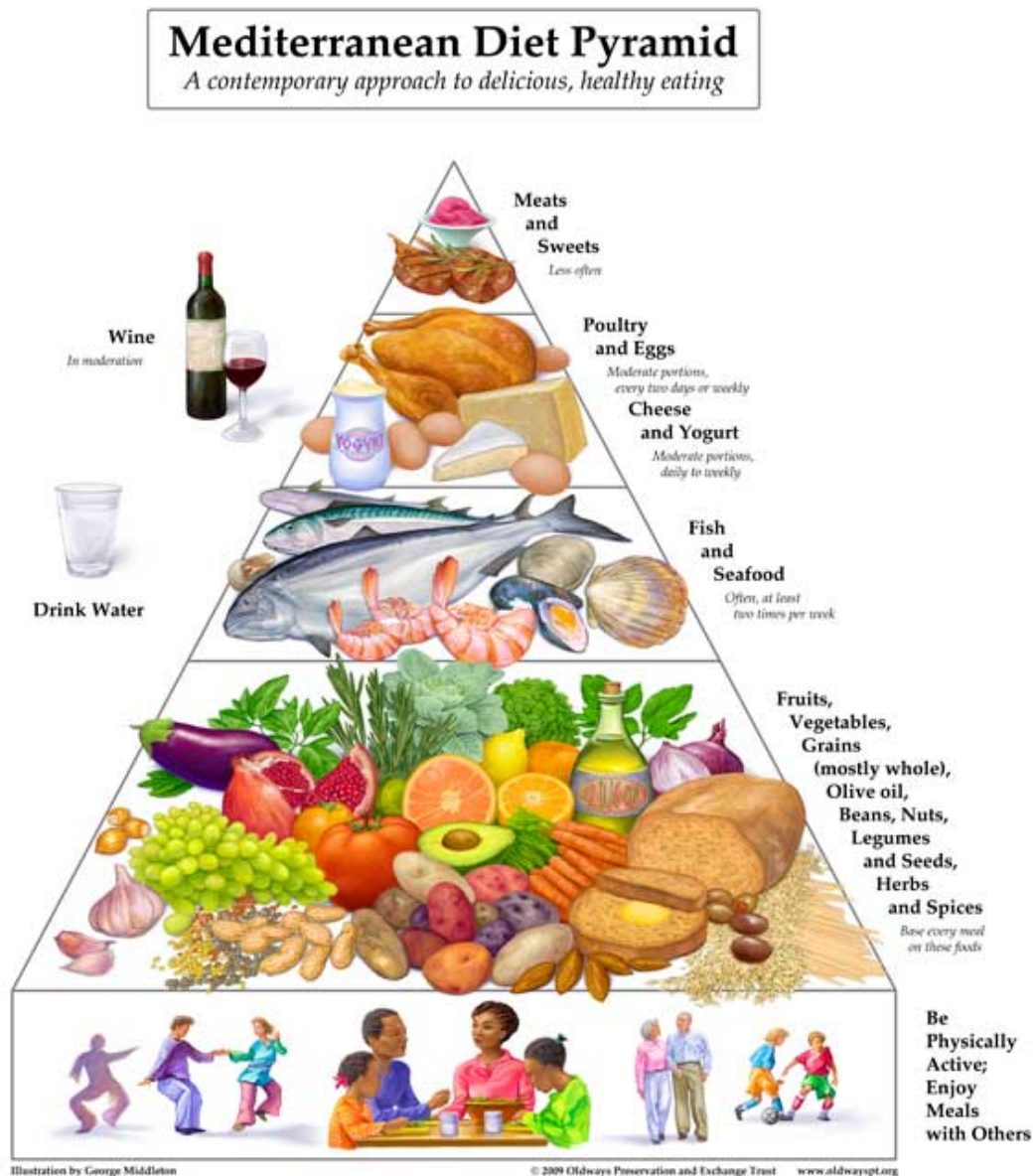


Figure 2. The Mediterranean Diet Pyramid (“Mediterranean Diet Pyramid,” n.d.).

The Mediterranean Diet Pyramid is set up similarly to The Food Guide Pyramid, with the base of the pyramid consisting of the foundation of the diet and what is needed in greater amounts, moving upward to those that are needed in moderate and smaller amounts.

Cereals and Tubers

The first group consists of bread, pasta, rice, corn, oats, barley, spelt and potatoes. There is an important emphasis on making roughly 80% of the grains



consumed whole grains, incorporating a source of fiber into the diet. Being the basis of the pyramid, it is required daily in the diet as an important source of starch, or

easily utilized energy by the body. With that being said, it is not recommended to intake large quantities, but to take in amounts relative to the proportion needed by the particular individual. Some of these foods contain vitamins within the B group and contain an adequate amount of protein, and if taken with legumes, will constitute a complementary protein meal and therefore yield a high protein intake if used as the basis of the diet, as recommended. Due to lack of the amino acid lysine in cereals and methionine in legumes, the two combined or eaten within 24 hours of one another will make for a complementary protein almost equal to that of a meat protein.

Fruit and Vegetables



There is a large emphasis on consuming quite a variety of fruits and vegetables, including fresh legumes. The typical Mediterranean Diet stresses eating fruits and vegetables as fresh and as seasonal as possible, producing a much better quality and taste of product. They provide an important source of fiber as well as a variety of vitamins and minerals needed by the body. Some minor, but important components that fruits and vegetables also contain are antioxidants, phytochemicals, water, and high satiety while yielding a low calorie content. By consuming a large amount of fruits and vegetables, it is likely that a variety will be consumed and thus a variety of much needed nutrients will be incorporated into the diet. It is helpful to keep up with eating a variety of fruits and vegetables based on eating a variety of color with meals, so that different nutrient contents that each one provides will add the necessary vitamins and minerals to the diet.

Olive Oil

As the primary source of fat in the Mediterranean Diet, olive oil has been found to be associated with a low mortality for cardiovascular disease by decreasing plasma triglycerides, total and low-density lipoprotein (LDL) cholesterol, inflammation and oxidative damage, and increasing high-density lipoprotein (HDL) cholesterol and antioxidant status (Covas, Konstantinidou, and Fito, 2009). Olive oil is produced by pressing or crushing the olive and comes in different grades depending on how much of it has been processed. The quality of the oil is determined by how refined it is by heat and chemical treatments. Higher qualities are those that have undergone minimal



processing and are labeled as “Extra Virgin” or “Virgin,” believing to offer the greatest health benefits due to the fact that they are affected by little processing and therefore retain most of the nutrients from the olive. The Mediterranean diet uses olive oil for cooking while “Virgin” and “Extra Virgin olive oil” are best consumed raw, allowing the aroma and flavor to be most appreciated and for the natural components to have the most benefit. It is recommended to use olive oil in general as the main form of fat for preparing meals, as it is a healthy monounsaturated fat.

Fish and Seafood

Fish and seafood are preferred over other sources of meat due to the healthy fats they incorporate into the diet. The omega-3 fatty acids, EPA and DHA have been associated with improved fetal development and cardiovascular function, and decreased Alzheimer’s disease. Fish and seafood are also low-fat, high quality protein foods, rich in calcium, phosphorus and other nutrients that can lower blood pressure and reduce the risk of a heart attack and stroke (“Health Benefits of Fish,” n.d.). Fish and other seafoods are recommended to be eaten roughly two to three times per week.



Poultry, Eggs, & Dairy

Poultry comes second to fish, as it does not have quite the nutritional value that fish have to offer. Although it is higher up on the pyramid, it is still recommended to consume a moderate amount a few times a week.

Fish offers a better variety of nutrients and low-fat



options as well as omega-3s. Chicken is preferred as opposed to red meat; however, according to the pyramid. Eggs are recommended in moderation, that being two or three times per week. Dairy products consist of milk, yogurt, and cheese and are not only high in calcium, but also offer a high quality protein. It is recommended that dairy products be consumed in low-fat or non-fat forms and be eaten in moderation. These products belonging to animal origin of protein are of high biological value as well as different vitamins from the B complex, fat-soluble vitamins A and D and some trace elements.

Meats and Sweets

Reaching the very top of the pyramid, meats and sweets are allowed, but should be eaten in small amounts, and no more than a few times a month. As red meat is the opposite of lean meat, it is high in saturated fat and raises cholesterol. Although there are lean cuts of red meat available, fish and poultry offer less fat content and are found to be more heart healthy.



Sweets can be high in sugar or fat content, both of which are not beneficial to the body in significant amounts. The simple carbohydrates found in sweets are the opposite of the complex carbohydrates used as the main foundation of the diet and tend to be found in processed and refined sugars. They are often referred to as “empty calories,” offering a high amount of calories without any nutritional value.



Wine

Red wine taken in moderation has been shown to reduce the risk of developing heart disease compared to those who do not drink at all or in those who are heavy drinkers (“Wine and Heart Health,” 2015). The limit for women is one 4-ounce glass per day, and the limit for men is two 4-ounce glasses per day.



Cardiovascular Disease in America

Cardiovascular disease is an umbrella term for any disorders of the heart or of the blood vessels. This term branches out to include coronary heart disease (heart attacks), cerebrovascular disease (strokes), hypertension, peripheral artery disease, rheumatic heart disease, congenital heart disease, and heart failure. It is safe to say that heart disease continues to be the leading cause of death for both men and women in the United States. This statistic has been true since 1921 and has remained unchanged up until today. According to the Centers for Disease Control and Prevention (“Heart Disease Facts,” 2015) over 610,000 people, or one in four, die each year of heart disease. Some of the key risk factors contributing to the onset of heart disease include high blood pressure, high cholesterol, and smoking. Almost 50% of adult Americans have or do at least one of the three. Other risk factors include diabetes, overweight or obesity, excessive alcohol use, poor diet, and physical inactivity.

The typical American diet has been found to exceed the recommended intake levels of calories from solid fats, sugars, refined grains, sodium and saturated fat. They eat less than the recommended amount of fruits, whole-grains, vegetables, dairy

products, and oils according to the President's Council on Fitness, Sports & Nutrition's Facts and Statistics.

Meat consumption has been increasing since the 1950s, and the consumption of eggs has been decreasing. Americans are also found to be drinking less milk, and consuming more cheese, a source of solid fat found popular in the American diet. There has been a rise in the consumption of added fats in the American diet as well as in grain consumption. The increase in use of corn sweeteners corresponds to the increase in consumption of high sugar foods and the small one-fifth increase in fruit and vegetable consumption since 1970 demonstrates that Americans do not have fruits and vegetables as a high priority in their diet as compared to the Mediterranean diet.

The high cardiovascular disease rates associated with the consumption of high fat and high-refined sugar meals with less than adequate consumption of fruits and vegetables and whole-grains demonstrates that there is possibly a connection between diet and disease. The Mediterranean diet, characterized by healthy fat, high fruit and vegetable, and high whole-grain consumption, can show possible improvement in cardiovascular disease rates, whether it reduces the risk or is used by means as a secondary prevention of cardiovascular disease.

Cardiovascular Disease in the Mediterranean Region

Epidemiological data has shown that those living in the Mediterranean region have a more favorable health status as compared to the United States. Despite the high prevalence of smoking and inferior healthcare status, the mortality rates in the Mediterranean are lower than most other countries (Dontas, Zerefos, Panagiotakos, and

Valis, 2007). The Greek and Italian populations are reported to have higher life expectancies and some of the lowest mortality rates.

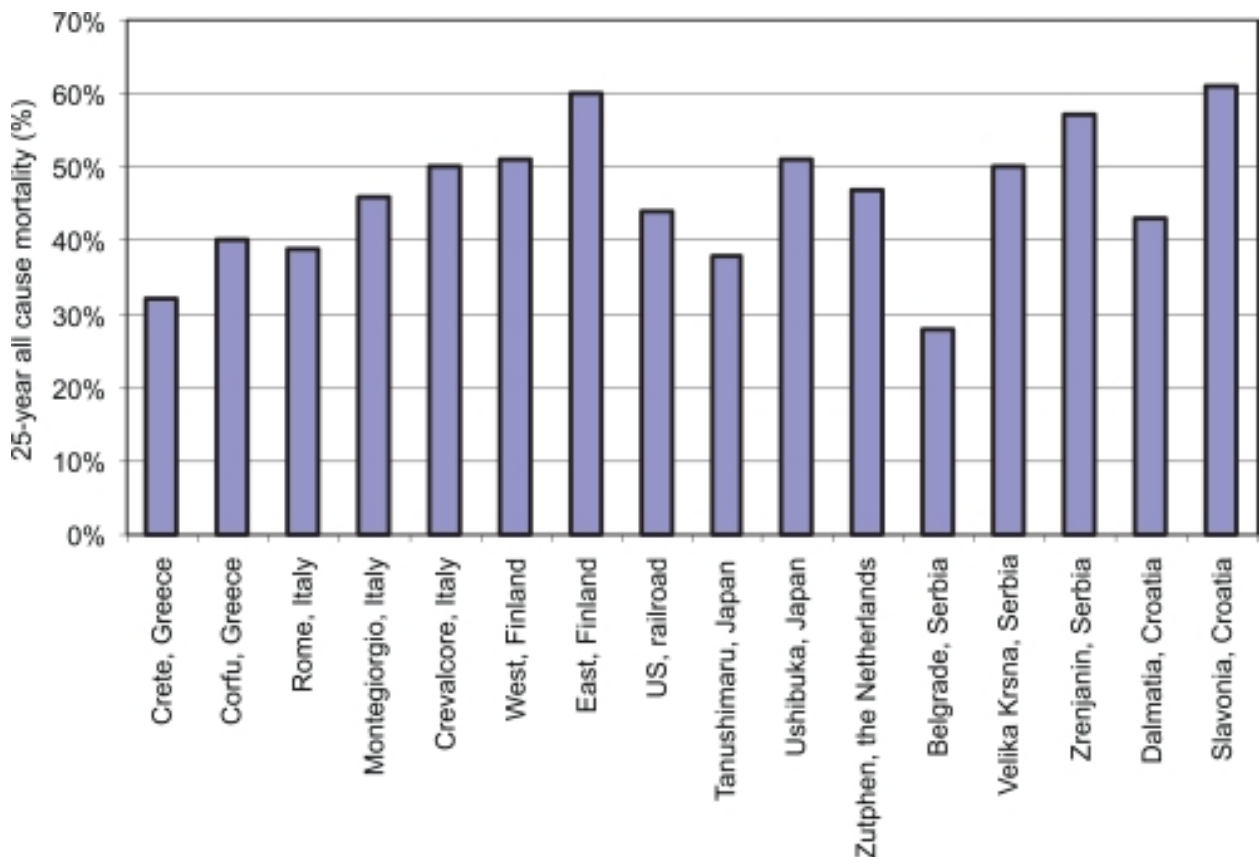


Figure 3. 25-year all-cause mortality from Seven Countries Studies cohorts (Dontas et al., 2007).

According to the World Health Organization, cardiovascular mortality rates differ greatly between northern and southern European populations and results concluded from the Seven Countries Study showed that cardiovascular disease prevalence varied from 2%-10% in southern Europe to 10%-18% in northern Europe (Dontas et al., 2007).

- Yugoslavia is characterized by the predominantly animal fat diet in the east and a primarily vegetable fat diet in the west.

- Italy is presented as the most representative of the Mediterranean lifestyle as it is characterized by grains, legumes, pasta, fruits, vegetables, olive oil, wine and bread.
- Greece is portrayed through its significant use of olive oil, fish, seafood, grains, starches, legumes, fruits and vegetable use, similar to Italy with an occasional consumption of meat and chicken. Greece provides a diet high in monounsaturated fats and low in saturated fats.
- Finland uses lots of breads and meats, packing a high saturated fat diet used to help discover the correlation between diet and cardiovascular disease.
- The Netherlands relies on meat, butter fat, and tuberous vegetables with minimal fruits, vegetables, legumes, grains, fibers, and complex carbohydrates.
- Japan, characterized by a diet low in animal fats, has a diet high in fish, complex carbohydrates, and moderate protein intake with a higher salt intake.

Effects of the Mediterranean Diet

Primary Prevention

Primary prevention means to prevent a disease or condition from happening in the first place. It is a form of preventative care to reduce the chance of a disease or condition occurring for the first time. Many studies have been conducted to determine whether or not the Mediterranean Diet is beneficial in preventing cardiovascular disease by means of a

primary prevention. For example, one study in Spain took a total of 7,447 participants ranging from 55 to 80 years of age who were at high risk for cardiovascular disease, but did not have cardiovascular disease, and assigned them one of three diets: a Mediterranean diet appended with extra-virgin olive oil, a Mediterranean diet supplemented with mixed nuts, and a control diet given the advice to simply reduce their fat intake. Over the span of five years, the results found that those on the Mediterranean diet supplemented with extra-virgin olive oil or nuts had a reduced incidence of major cardiovascular events compared to the control group given the reduced dietary fat advice (Estruch et al., 2013).

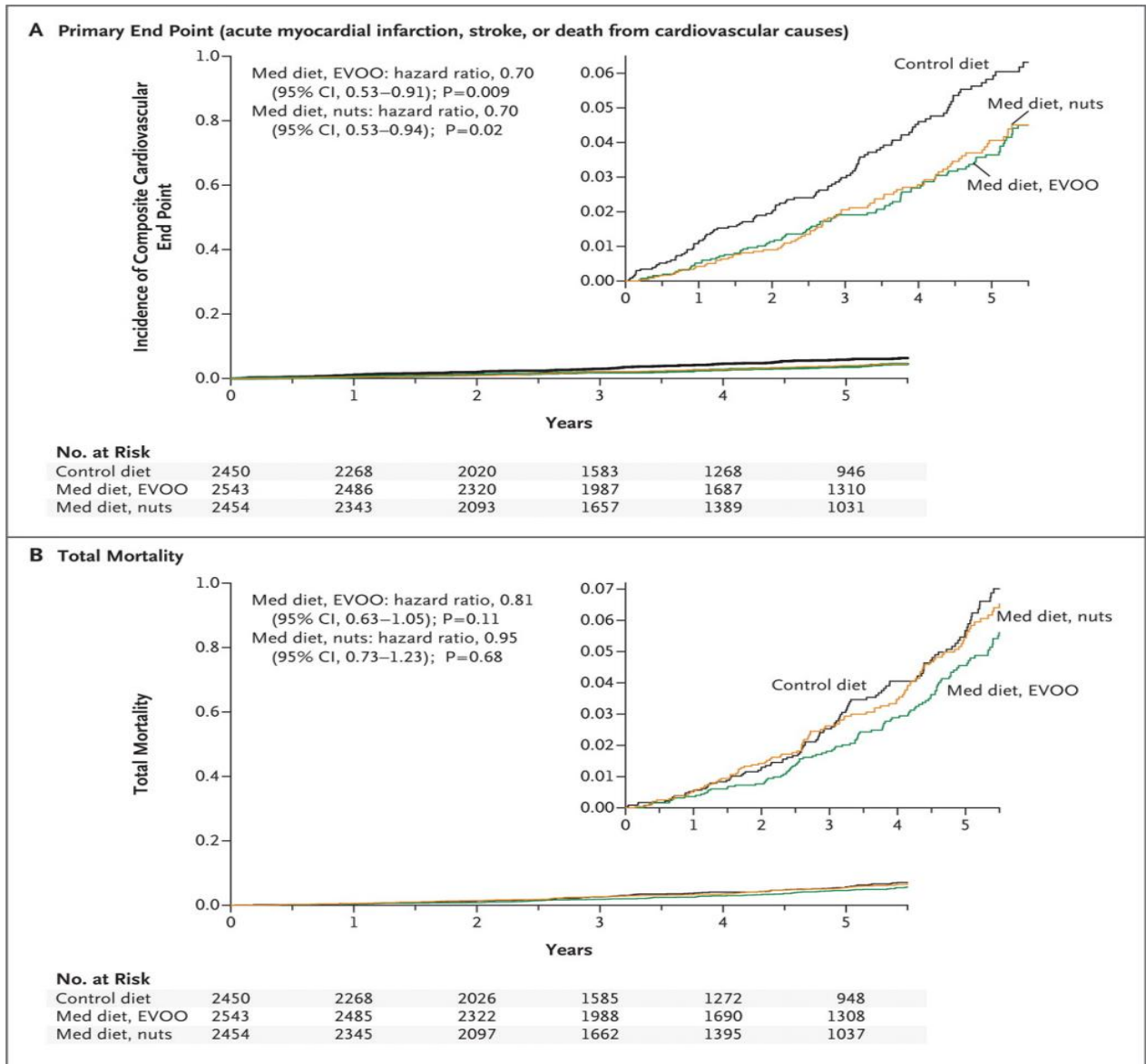


Figure 4. Kaplan-Meier estimates of the incidence of outcome events in the total study population (Estruch et al., 2013).

The top graph, panel A, demonstrates the prevalence of the primary end point for those on each of the three different diets. The primary end point includes any incidence including acute myocardial infarction, stroke, or death due to cardiovascular causes. As shown, those on the control diet had the highest incidence rates, while each modified Mediterranean diet were significantly lower. The lower graph, panel B, represents the total mortality of the

individuals in the study. The highest rate of mortality occurred within the control group in at a higher rate over 5 years of follow-up while the experimental diets were slightly lower rates. Overall, the study showed that the Mediterranean diet could reduce the risk of cardiovascular disease by almost 30%.

Another study was conducted to examine the effects of the Mediterranean diet on those with a risk of developing heart failure or death due to heart failure in men. Even though the study does not examine the overall effects on cardiovascular disease, heart failure is a more defined term that is categorized within the scope of cardiovascular diseases. It occurs when the heart muscle doesn't pump blood up to the standard that it should be pumping. This can be due to coronary artery disease (narrowing of arteries in the heart), or high blood pressure, making the heart too weak or rigid to pump blood proficiently. The study was comprised of 37,308 men from the Cohort of Swedish Men with the absence of cardiovascular disease and utilized a modified Mediterranean diet (mMED) score to assess diets of those more closely related to the Mediterranean diet via a food frequency questionnaire. It was concluded that a high devotion to a Mediterranean-based diet was linked to a lower risk of heart failure and death due to heart failure in men (Tektonidis, Akesson, Gigante, Wolk, and Larsson, 2016).

A similar study examined the effects of the Mediterranean diet on populations at risk of myocardial infarctions, heart failure, and ischemic stroke in 32,921 women in a Swedish prospective cohort. Using the same method of the mMED score and a self-administered food frequency questionnaire to examine the correlation between the number of incidences of myocardial infarctions, heart failures, and ischemic strokes and compare them to their diets to associate which were most similar to a Mediterranean Diet, a 10 year follow-up led to

similar conclusions drawn from the previous study stating that a “better adherence to a Mediterranean diet was associated with a lower risk of myocardial infarction, heart failure, and ischemic stroke” and is “most likely beneficial in primary prevention in all major types of atherosclerosis-related cardiovascular disease” (Tektonidis, Akesson, Gigante, Wolk, and Larsson, 2015).

Secondary Prevention

But what about those who have already experienced some form of cardiovascular disease? In order to prove that the Mediterranean diet is useful in a clinical practice to treat or reverse symptoms and risk factors for those who have cardiovascular disease, sufficient research on secondary prevention must be done. Secondary prevention is described as slowing down the development of a disease or condition after it has already occurred or to prevent another occurrence from happening.

One study called the Lyon Diet Heart Study tested whether a Mediterranean-type diet would reduce the recurrence after a myocardial infarction had already occurred. They compared it to the traditional Western diet to observe the effects a Mediterranean-type diet would have on the protective effect (Lorgeril et al., 1999). The experimental group was instructed to implement a Mediterranean-type diet that had more bread, more root and green vegetables, more fish, fruit at least once a day, less red meat (replaced with poultry), and margarine that was supplied by the study to replace butter and cream. The margarine had saturated fatty acid and oleic acid comparable to that in olive oil. The control group, on the other hand, was not instructed with any dietary advice other than what is generally provided by hospital dietitians or physicians. After 46 months of follow-up, 204 and 219 experimental subjects

participated in the final examination; however, the study was cut short early due to significant beneficial effects observed in the experimental group.

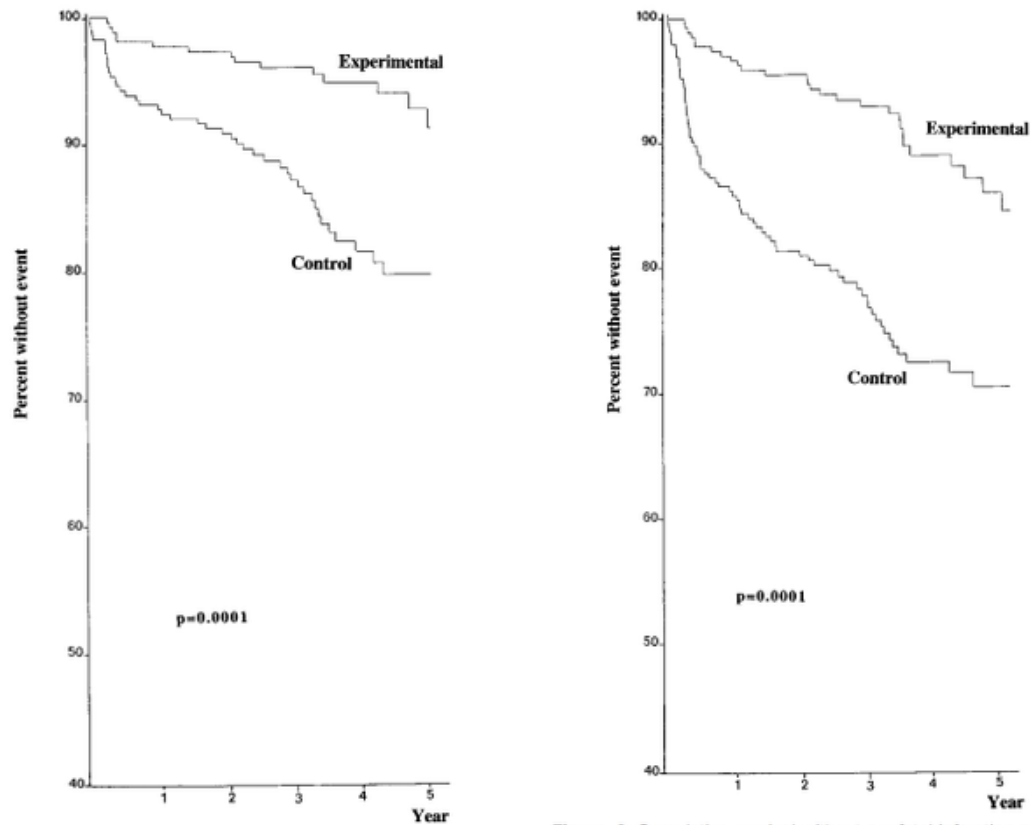


Figure 5. Cumulative survival rates in cardiac subjects on a Western diet (Control) and on a Mediterranean diet (Experimental) in CO 1 (Composite Outcomes) category and CO 2 category (De Lorgeril et al., 1999).

In the graph, the control group had more mortality rates than the experimental group in the primary category (CO 1 or Composite Outcomes 1), including cardiac death and nonfatal myocardial infarction. The same results occurred in the primary and secondary category (CO 2 or Composite Outcomes 2), which included primary results as well as unstable angina, stroke, heart failure, and pulmonary or peripheral embolism. With the climbing trend in results of the control group having higher mortality rates than the experimental group, the all endpoints category included both the primary and

secondary categories as well as minor events requiring hospital admission. Those following the Mediterranean-style diet were found to have a 50% to 70% lower risk of repeated heart disease, as measured by cardiac death and nonfatal heart attacks; the preceding plus unstable angina, stroke, heart failure, and pulmonary or peripheral embolism; and all the above plus events requiring hospitalization (Kris-Etherton, Eckel, Howard, Jeor, and Bazzarre, 2001).

Another study used coronary heart disease patients who were at high risk of cardiac death and examined the effects of the Mediterranean diet in preventing early mortality or reducing the risk of another attack. More specifically, the study aimed to prevent a coronary thrombosis, a malignant ventricular arrhythmia and development of left ventricular dysfunction, and a reduction in the risk of plaque erosion and ulceration. Ultimately, the success that the Mediterranean diet has on reducing coronary atherosclerosis or thrombosis and the risk of cardiac complications implies that the Mediterranean diet should be used as a dietary pattern for heart disease patients (De Lorgeril and Salen, 2011).

Similar to the Lyon Diet Heart Study, another study uses two different diets to compare which was more beneficial, and if the Mediterranean diet showed any more benefits as compared to the other. The study compares the results of beneficial mechanisms between the Mediterranean diet and the low-fat Therapeutic Lifestyle Changes Diet as a means of secondary prevention in coronary heart patients. While the Therapeutic Lifestyle Changes diet is similar to the Mediterranean diet with encouraged consumption of lean meats, fruits, vegetables, and grains, it has limitations with regards

to cholesterol, exercise, and caloric intake whereas the Mediterranean diet is based on a more natural lifestyle.

Nutrient Goal	Mediterranean Diet	TLC Diet
Energy	To maintain desirable weight	To maintain desirable weight
Protein	12%-17% of total calories	Approximately 15% of total calories
Carbohydrate	45%-50% of total calories	55%-60% of total calories
Total fat	33%-38% of total calories	25%-30% of total calories
Monounsaturated fat	20%-25% of total calories	Up to 20% of total calories
Polyunsaturated fat	Up to 10% of total calories	Up to 10% of total calories
Saturated fat	≤8% of total calories	≤7% of total calories
Omega-3 fats	>0.75% of total calories	*
Cholesterol	<200 mg/day	< 200 mg/day
Dietary fiber	20-30 g/day	20-30 g/day
Therapeutic lifestyle		

Nutrient Goal	Mediterranean Diet	TLC Diet
components of TLCD		
Plant stanols/sterols	*	2 g/day
Increased viscous fiber	†	10-15 g/day

*Value not established by National Cholesterol Education Program Third Adult Treatment Panel (Third report of the National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) final report. *Circulation* 2002;106:3143-3421).

†Value not established by Mediterranean dietary patterns.

Figure 6. Energy and nutrient recommendations for Mediterranean diet and Therapeutic Lifestyle Changes diet (Thomazella et al., 2011)

The differences between the recommendations for the Mediterranean diet and Therapeutic Lifestyle Changes diet are slight, but important, as both have the intention of reducing the incidences of cardiovascular diseases. The Mediterranean diet puts more of an emphasis on fats, particularly having a higher goal of fat intake than the Therapeutic Lifestyle Changes diet. The Mediterranean diet has more total fat, more monounsaturated fat and stress on consuming omega-3 fats in particular. The Therapeutic Lifestyle Stress diet has a slightly higher goal of carbohydrate intake.

Using an all-male population aged 45-65 years old, roughly half (20) were put on the Mediterranean diet while the other half were put on the Therapeutic Lifestyle Changes diet. The study found that the Mediterranean diet promoted a decrease in blood leukocyte count and increased high-density lipoprotein (HDL) levels as well as baseline brachial artery diameter. Studies have shown that an elevated white blood cell count, or blood leukocyte count, have been directly associated with an increased incidence cardiovascular disease and mortality from cardiovascular disease (Lee et al.,

2001). Research has also shown that low HDL is an independent risk factor for coronary artery disease while high HDL is associated with longevity and protective artery effects (Toth, 2004). An increase in baseline brachial artery diameter has also been shown to be affiliated with a decreased risk of cardiovascular disease. On the other hand, the Therapeutic Lifestyle Changes Diet decreased low-density lipoprotein levels and oxidized low-density lipoprotein plasma levels (Thomazella et al., 2011). A high level of low-density lipoprotein leads to plaque buildup in the arteries and can result in the formation of heart disease or a stroke (LDL and HDL, 2015). Therefore by lowering low-density lipoprotein levels, the risk for heart disease or another occurrence of heart disease decreases. In conclusion, both diets showed atheroprotection via different markers, but overall, the Mediterranean diet can be used as an alternative diet with different beneficial results for coronary heart disease individuals.

Beyond the Fork

The Mediterranean diet encompasses a lifestyle that does not just influence eating patterns, but goes beyond the world of food. In Greek, the translation of the word *diata*, or diet, refers to the “art of living.” Therefore in following with the traditional definition of the *diata*, the Greek and Mediterranean way of life extends past what’s cooking in the kitchen and examines the social aspect and location of the meal altogether. The base of the pyramid (return to Figure 2) encourages eating with others and incorporating a social dining experience. The emphasis on social dining is the exact opposite of what Americans would come to find helpful to their “dieting” experience, as most find themselves eating more when dining in a social setting. Portion sizes are bigger and usually plates are not as nutrient-dense allowing empty calories to be eaten

with no nutritional value in comparison to the Mediterranean Diet. For some, sitting among people they do not know as well can be nerve-racking and constantly filling their mouths with food can ease the tension of them having to talk among everyone else at the table. In contrast, those living in the Mediterranean region are found to be savoring their food rather than gulping it down. Every meal is turned into a social occasion with friends and family, so even though food is the center or excuse for the gathering, there is much more emphasis on spending quality time with others and building relationships with those around. Travel writer Marcy Gordon explains her experience dining in Italy where a chef makes it his sole duty to constantly put food onto their table and into their mouths. They were showered with salami and cheese, grilled tomatoes, wild mushrooms, grilled eggplant and olives, grilled peppers, and an assortment of desserts. He required them to eat every bite, and would not take no for an answer, as it is rude to turn away food, especially from a chef who is also serving. Their meal lasted four and a half hours among friends and fresh food. It is a perfect example of the food culture that countries such as Greece, Southern France, and Italy, all partake in: the value of sharing and eating a meal with friends and family are infused into their culture. Eating is treated as a delicacy, slowing down time and focusing on those *at* the table rather than solely what's *on* the table.

The Mediterranean diet, or lifestyle so to speak, includes being physically active. As opposed to the “American style” of being physically active by putting aside an hour of time in an enclosed structure and riding a stationary bike for a boring 60 minutes each day, the Mediterranean region gets exercise through outdoor activities such as bike riding or walking. These activities can be done being accompanied by others as

well, putting more emphasis on the importance of the Mediterranean lifestyle foundation of having human beings as a support system. Referring back to the Mediterranean Diet Pyramid (Figure 2), physical activity is at the base of the pyramid, as a reminder that exercise in association with the diet is needed to see the reduction in cardiovascular risk factors that the Mediterranean diet is correlated with. As with a lifestyle change in diet, physical activity is equally important in reducing risk factors for cardiovascular disease, such as hypertension, insulin resistance, hypertriglyceridemia, low HDL, and obesity (Jennings et al., 1986). Socializing is also important in the Mediterranean Diet as it represents a healthy lifestyle incorporated into the diet and that the diet itself is not the only important factor.

An article in *The New York Times* titled “The Mediterranean Diet: Is It the Food or the Lifestyle?” follows a British cardiologist, Dr. Aseem Malhotra, who created a documentary during his visit to Pioppi, Italy. He chose Pioppi because the American scientist, Ancel Keys, resided there for the remaining thirty years of his life. Believing in the great benefits the Mediterranean diet has to offer, Dr. Malhotra even prescribes his own patients with olive oil and was ready to observe the traditional diet in the Mediterranean region. He found that beside the diet having longevity factors there were others as well, including the social interactions and physical activity choices. Stress levels were low, as people savored every bite and that there were many who spent a great deal outdoors experiencing leisurely activity.

Turning a New Leaf

In order to implement a true Mediterranean diet, one must change their overall lifestyle. The Mediterranean diet, as discussed previously, encompasses not only a diet

rich in fruits and vegetables, grains, beans and fish, but also social interactions and physical activity.

The food in the Mediterranean diet has a few key similarities that make up a defining characteristic of the diet as well as the region that makes up the diet. It focuses on seasonal, fresh foods, traditional options, and local products (Palmer, 2013).

Shopping at a local farmers market is great for meeting with the people who put blood, sweat, and tears into producing food to be used and cooked in meals. There is more appreciation when buying from local farmers as well as when buying foods in season. Buying seasonally not only is cheaper than buying in the off-season, but it also puts forth the trying of new produce in place of those that may not be in season, yet. For someone to be open to applying a new way of preparing their meals, they must be open to trying new foods, new styles, new methods of cooking, and an overall new lifestyle.

Processed foods are not welcome in the Mediterranean lifestyle especially anything categorized as a “sweet,” Processed foods, and especially anything with sugar, should be eaten very rarely. Snacks, for example, can be modified to encompass a Mediterranean style, including nuts, raw carrots, celery, or other vegetable, citrusy tangy oranges, juicy apples, or fresh grapes. Those are just to name a few simple snacking ideas.

Another key aspect of opening up to a new lifestyle is searching for variety and new recipes and ideas to keep plates interesting. Ever cooked with eggplant? Well, the Internet is an ocean for finding recipes incorporating foods someone has never cooked with before. On the Food Network website, there is a delicious recipe under their “Mediterranean Diet Recipes” that is an Eggplant with yogurt and dill side dish; an

excellent resource for finding Mediterranean diet-inspired dishes. There are also boundless books and recipes everywhere regarding Mediterranean dishes and how to cook them such as “Mediterranean diet Cookbook for Dummies” by Meri Raffetto or the “Mediterranean Diet for Beginners: The Complete Guide” by Rockridge Press for those starting out on a Mediterranean diet.

On a tight budget, penny-saving techniques can be used to achieve living the Mediterranean style. Buying frozen fruits and vegetables are still keeping in sync with the “fresh” theme the Mediterranean diet has, as most produce is frozen at its peak freshness. Using canned fruits and vegetables do not hurt either, as simply getting as many fruits and vegetables into the day as the diet permits is difficult enough. Sacrificing freshness for canned options would simply be a cheaper option. Purchasing dry beans and soaking them tends to be cheaper than buying them canned, and also allows the cook to control the amount of salt that goes into them. However, the Mediterranean diet advocates for use of spices and herbs to season dishes.

There are many helpful hints to alter lifestyle to fit the Mediterranean diet as well as great budgeting tips to prevent from breaking the bank on a Mediterranean diet in contrast to, for example, a Western diet. Eating slowly and communing with friends and family is also a key variable in the Mediterranean diet and one can practice by appreciating where each food came from and how it all has come together to create a delicious meal to nourish the body. Simple awareness can help with appreciation.

Living an active lifestyle also goes hand-in-hand with the Mediterranean diet. Putting down the remote and getting outside for a leisurely stroll every day for 30 minutes is better than not getting out at all. Turning what seems like tedious exercise

into something fun and meaningful can also help create a happier execution of the diet. Establishing a weekly or even daily walking routine with a good friend or even a neighbor to get to know better, can establish some purpose in a routine. Biking, swimming, hiking, dancing, among other fun activities can give physical activity a more fun experience and more meaningful purpose in someone's day.

Conclusions

Since the world of nutrition is a relatively new science, and there is constant research coming out making new health statements, the Mediterranean diet became widely known due to its discovered health claims. The Seven Countries Study, along with other research, holds that it could possibly be of benefit to many people in the United States who are suffering from heart disease, the number one leading cause of death. Not only can it help prevent another occurrence in those with heart disease, but it can also reduce the risk of it occurring the first time. For those who have risk factors such as high blood pressure, high cholesterol, diabetes, smoking, overweight or obesity, have a family history of heart disease, or women who are age 55 or older can benefit by reducing the risk of suffering from an attack. Better to be safe than sorry, right?

Although each food group that makes up the Mediterranean diet has health benefits, all of them together provide the most beneficial health experience for the body rather than just eating one food group or another. It is also composed of the traditional diets of different cultures residing in the Mediterranean region and encompasses a lifestyle change, not a "fad diet." Because the research and observations are based on the diet of other cultures rather than bogus health claims such as the "Grapefruit diet" where people can shed a few pounds for a few weeks, the Mediterranean diet shows

nutrition benefits and is considered a lifestyle change all together rather than a temporary weight loss program. It goes beyond the plate and extends to social interactions around the plate. It also requires exercise, or any physical activity that gets the body active and moving.

In addition to its protective heart health benefits, the Mediterranean diet is also claimed to aid in protection against type 2 diabetes; reducing the risk of Alzheimer's disease, Parkinson's disease, and cancer; increasing longevity (as Keys demonstrated, living to be almost 101!); and reducing muscle weakness and frailty (Godman, 2013). As it is important to eat a healthy diet, the Mediterranean focuses on key food groups that Americans already have trouble getting into their diet as it is. With the health benefits the Mediterranean diet has to offer, nutrition and diet are being shown to be the best medicine to reducing the risk that unhealthy food is normally the cause of to begin with. Maybe it is necessary for everyone to incorporate such a diet, with emphasis on local Mediterranean cuisine, fresh foods, and traditional plates, until we can come up with an American diet that holds the characteristics the Mediterranean diet is exemplifying, and puts a stop to spreading disease, pain, and death to us and those around us.

References

- Allison, T.G., (2011). *Best diet for CHD Prevention* [PowerPoint slides]. Retrieved from <http://slideplayer.com/slide/1621397/>
- Altomare, R., Cacciabaudo, F., Damiano, G., Palumbo, V.D., Gioviale, M.A., Bellavia, M., . . .
Lo Monte, A.I. (2013). The mediterranean diet: a history of health. *Iranian Journal of Public Health*, 42(5): 449-457. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3684452/>
- Covas, M.I., Konstantinidou, V., and Fito, M. (2009) Olive oil and cardiovascular health. *J Cardiovascular Pharmacology*, 54. Retrieved from www.ncbi.nlm.nih.gov/pubmed/19858733
- De Lorgeril, M., and Salen, P., (2011). Mediterranean diet in secondary prevention of CHD. *Public Health Nutrition*, 14(12A):2333-2337. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/22166192>
- De Lorgeril, M., Salen, P., Martin, J.L., Monjaud, I., Delaye, J., and Mamelle, N., (1999). Mediterranean diet, traditional risk factors, and the rate of cardiovascular complications after myocardial infarction. *Circulation*, 99:779-785. Retrieved from <https://circ.ahajournals.org/content/99/6/779.full.pdf>
- De Lorgeril, M., Salen, P., Paillard, F., Laporte, F., Boucher, F., and Leiris, J. (2002, 1 June). Mediterranean diet and the French paradox: two distinct biogeographic concepts for one consolidated scientific theory on the role of nutrition in coronary heart disease.. *Cardiovascular Research*, 503-515. Retrieved from <http://cardiovascres.oxfordjournals.org/content/54/3/503>

- Dontas, A.S., Zerefos, N.S., Panagiotakos, D.B., and Valis, D.A., (2007). Mediterranean diet and prevention of coronary heart disease in the elderly. *Clinical Interventions in Aging*, 2(1): 109-115. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2684076/>
- Estruch, R., Ros, E., Salas-Salvado, J., Covas, M.I., Corella, D., Aros, F., Gomez-Gracia, E., . . . Martinez-Gonzalez, M.A., (2013). Primary prevention of cardiovascular disease with a mediterranean diet. *The New England Journal of Medicine*, 368: 1279-1290. Retrieved from <http://www.nejm.org/doi/full/10.1056/NEJMoa1200303>
- Facts and statistics. (n.d.). *President's Council on Fitness, Sports and Nutrition*. Retrieved from <http://www.fitness.gov/resource-center/facts-and-statistics/>
- Godman, H., (2013). Adopt a Mediterranean diet now for better health later. *Harvard Health Letter*. Retrieved from <http://www.health.harvard.edu/blog/adopt-a-mediterranean-diet-now-for-better-health-later-201311066846>
- Health benefits of fish. (n.d.). *Washington State Department of Health*. Retrieved from <http://www.doh.wa.gov/CommunityandEnvironment/Food/Fish/HealthBenefits>
- Heart disease facts. (2015). *Centers for Disease Control and Prevention*. Retrieved from <http://www.cdc.gov/heartdisease/facts.htm>
- Jennings, G., Nelson, L., Nestel, P., Esler, M., Korner, P., Burton, D., and Bazelmans, J. (1986). The effects of changes in physical activity on major cardiovascular risk factors, hemodynamics, sympathetic function, and glucose utilization in man: a controlled study of four levels of activity. *Circulation*, 73(1): 30-40. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/3510088>

- Kris-Etherton, P., Eckel, R.H., Howard, B.V., St. Jeor, S., and Bazzarre, T.L., (2001).
Benefits of a Mediterranean-style, National Cholesterol Education
Program/American Heart Association step 1 dietary pattern on cardiovascular
disease. *AHA Science Advisory*, 103: 1823-1825. Retrieved from
<http://circ.ahajournals.org/content/103/13/1823.full>
- Kromhout, D. (1989) Food consumption patterns in the seven countries study. Seven
countries study research group. *Annals of Medicine*, 21(3): 237-238. Retrieved
from <http://www.ncbi.nlm.nih.gov/pubmed/2765266>
- Lee, C.D., Folsom, A.R., Nieto, F.J., Chambless, L.E., Shahar, E., and Wolfe, D.A., (2001).
White blood cell count and incidence of coronary heart disease and ischemic
stroke and mortality from cardiovascular disease in African-American and White
men and women: atherosclerosis risk in communities study. *American Journal of
Epidemiology*, 154(8):758-764. Retrieved from
<http://www.ncbi.nlm.nih.gov/pubmed/11590089>
- LDL and HDL: “Bad” and “good” cholesterol. (2015). *Centers for Disease Control and
Prevention*. Retrieved from http://www.cdc.gov/cholesterol/ldl_hdl.htm
- Mediterranean diet pyramid. (n.d.). *Oldways Health Through Heritage*. Retrieved from
[http://oldwayspt.org/resources/heritage-pyramids/mediterranean-
pyramid/overview](http://oldwayspt.org/resources/heritage-pyramids/mediterranean-pyramid/overview)
- Palmer, S., (2013). The Mediterranean diet – an up-close look at its origins in
pantelleria. *Today’s Dietitian*, 15(5): 28. Retrieved from
<http://www.todaysdietitian.com/newarchives/050113p28.shtml>

- Palmieri, L., Bennett, K., Giampaoli, S., and Capewell, S., (2010). Explaining the decrease in coronary heart disease mortality in Italy between 1980 and 2000. *American Journal of Public Health*, 100(4): 684-692. Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2836342/>
- Tektonidis, T.G., Akesson, A., Gigante, B., Wolk, A., and Larsson, S.C., (2016). Adherence to a Mediterranean diet is associated with reduced risk of heart failure in men. *European Journal of Heart Failure*, 18(3): 253-259. Retrieved from <http://0-www.ncbi.nlm.nih.gov.wncln.wncln.org/pubmed/26781788>
- Tektonidis, T.G., Akesson, A., Gigante, B., Wolk, A., and Larsson, S.C., (2015). A Mediterranean diet and risk of myocardial infarction, heart failure and stroke: a population-based cohort study. *Atherosclerosis*, 243(1): 93-98. Retrieved from <http://0-www.sciencedirect.com.wncln.wncln.org/science/article/pii/S0021915015301027>
- Thomazella, M.C., Goes, M.F., Andrade, C.R., Debbas, V., Barbeiro, D.F., Correia, R.L., ... Laurindo, F.R., (2011). Effects of high adherence to Mediterranean or low-fat diets in medicated secondary prevention patients. *The American Journal of Cardiology*, 108(11):1523-1529. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/21890081>
- Toth, P.P., (2004). High-density lipoprotein and cardiovascular risk. *Circulation*, 109:1809-1812. Retrieved from <http://circ.ahajournals.org/content/109/15/1809.long>

Wine and heart health. (2015). *Medline Plus*. Retrieved from

<https://www.nlm.nih.gov/medlineplus/ency/article/001963.htm>