

Dietary Patterns: The Cornerstone for Optimal Cardiometabolic Health

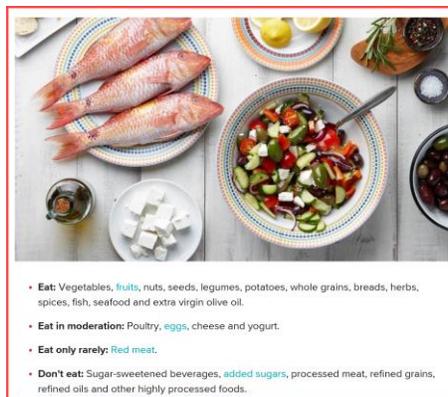
There is enough evidence to suggest that of dietary composition has significant impact in primordial, primary and secondary prevention of disease, particularly cardiovascular disease and chronic diseases like diabetes though the contribution of medications and clinical procedures increases over time with disease progression.

As a cardiologist with special interest in cardiovascular prevention, I often encounter questions from patients regarding risks and benefits of dietary patterns. There has been special public interest in intermittent fasting, keto diet and vegan diet. Let's take a quick look at the popular diet plans and how they impact overall health particularly cardiovascular health.

Mediterranean diet

It's generally accepted that the folks in countries bordering the Mediterranean Sea live longer and suffer less from cancer and cardiovascular ailments, than most Americans. Mediterranean diet come from the historic eating and social patterns of the regions around southern Italy, Greece, Turkey and Spain.

The not-so-surprising secret is an active lifestyle, weight control, and a diet low in red meat, sugar and saturated fat and high in produce, nuts and other healthful foods. The Mediterranean Diet may offer a host of health benefits, including weight loss, heart and brain health, cancer prevention, and diabetes prevention and control.



Helpful links to Mediterranean diet and recipes

<https://factly.com/food/nutrition/mediterranean-diet-a-guide-to-get-you-started>
<https://www.healthline.com/nutrition/mediterranean-diet-meal-plan#foods-to-eat>
<https://health.usnews.com/best-diet/mediterranean-diet/recipes>

DASH Diet

The DASH Diet, which stands for dietary approaches to stop hypertension, is promoted by the National Heart, Lung, and Blood Institute to do exactly that: prevent hypertension. It emphasizes the foods you have always been told to eat (fruits, veggies, whole grains, lean protein and low-fat dairy), which are high in blood pressure-deflating nutrients like potassium, calcium, protein and fiber. DASH also discourages foods that are high in saturated fat, such as fatty meats, full-fat dairy foods and tropical oils, as well as sugar-sweetened beverages and sweets. Following DASH also means capping sodium at 2,300 milligrams a day.

Helpful links to DASH diet and recipes

<https://healthyeating.nhlbi.nih.gov/default.aspx>

<https://www.mayoclinic.org/healthy-lifestyle/recipes/dash-diet-recipes/rcs-20077146>

<https://momshealth.co/dash-diet-recipes/>

<https://www.webmd.com/hypertension-high-blood-pressure/features/dash-diet-meal-ideas#1>

Figure: Table displaying DASH and Mediterranean diet

	DASH Diet <i>(based on 2000 calorie diet)</i>	USDA Healthy Mediterranean <i>(based on 1800 calorie diet)</i>
Grains	6-8 servings daily	6 ounces daily (2 whole and 2 refined) per day
Vegetables	4-5 servings daily	2.5 cups daily
Fruits	4-5 servings daily	2 cups daily
Nuts, seeds, and legumes	4-5 servings daily	2 cups daily
Fat-free/ and low-fat dairy	2-3 servings daily	6 ounces daily
Lean meats, poultry, and fish	< 6 ounces daily	2 ounces daily
Fats and oils	2-3 servings daily	24 grams daily
Sweets and sugars	≤5 servings weekly	Limit - no quantity specified
Sodium	<2.3 grams sodium daily	Limit - no quantity specified
Alcohol	≤1 drink daily for women, ≤2 drinks daily for men	Limit - no quantity specified

The core benefits making these diets cardioprotective:

- Intake of total fruits and vegetables has been inversely associated with CVD risk.
- Marine fish is rich in long-chain omega-3 fatty acids, which are thought to reduce arrhythmias, thrombosis, inflammation, blood pressure, as well as favorably modify the lipid profile.
- Nuts and legumes are beneficial through their high unsaturated fat, fiber, micronutrient and phytochemical content.

Such a diet meaningfully lowers total carbohydrate, due to less refined carbohydrates and increases total fat – optimally exceeding the previously recommended cap of 35% of calories – due to increased nuts, fish, and vegetable oils.

Keto diet

Keto diet may be associated with some improvements in cardiovascular risk factors, such as obesity, type 2 diabetes and HDL cholesterol levels, but these effects are usually limited in time. Keto diet may result in weight loss and lower blood sugars, but it's a quick fix. More often than not, it's not sustainable. Oftentimes weight gain may come back, and you'll gain more than what you lost.

As KD are often rich in fats, some negative effects could happen. There are heart-healthy sources of fat, however if that person is not educated on heart-healthy sources of fat, they may consume excessive amounts of saturated fats that can increase your risk of heart disease. It limits whole grains and fruits, and is linked to increased risk of heart disease. Strict diets like keto could also cause social isolation or disordered eating.

Most cardiologists would not recommend the keto diet to their patients because it is ultimately not realistic or sustainable. The diet restricts fresh fruits and vegetables, whole grains and low-fat dairy that can help with long term weight loss and overall health.

The specific foods you choose on keto matter, too. In a study published in September 2010 in the Annals of Internal Medicine on women and men who followed a low-carb diet, those who heavily relied on animal sources of fat and protein, such as cheese and meat, had a 43 percent higher risk of mortality compared with those who emphasized vegetable sources, such as avocado and nuts, for those nutrients. However, those in the veggie low-carb group had a 20 and 23 percent lower risk of early death and heart disease, respectively.



Intermittent Fasting

A recent article in the New England Journal of Medicine (published in December 2019) is a nice review article on health benefits of intermittent fasting. The highlights of the review are mentioned.

In humans, intermittent-fasting interventions ameliorate obesity, insulin resistance, dyslipidemia, hypertension, and inflammation. Intermittent fasting seems to confer health benefits to a greater extent than can be attributed just to a reduction in caloric intake.

Studies in animals and humans have shown that many of the health benefits of intermittent fasting are not simply the result of reduced free-radical production or weight loss. Instead, intermittent fasting elicits evolutionarily conserved, adaptive cellular responses that are integrated between and within organs in a manner that improves glucose regulation, increases stress resistance, and suppresses inflammation.

Periodic flipping of the metabolic switch not only provides the ketones that are necessary to fuel cells during the fasting period but also elicits highly orchestrated systemic and cellular responses that carry over into the fed state to bolster mental and physical performance, as well as disease resistance.

Studies in animals and humans that have shown how intermittent fasting affects general health indicators and slows or reverses aging and disease processes. On the island of Okinawa, the traditional population typically maintains a regimen of intermittent fasting and has low rates of obesity and diabetes mellitus, as well as extreme longevity.

How to prescribe intermittent fasting:

Patients are prescribed intermittent fasting gradually, over a period of several months, reduce the time window during which they consume food each day, with the goal of fasting for 16-18 hours a day.

Alternatively, recommended is 5:2 intermittent-fasting diet, with 900 to 1000 calories consumed one day per week for the first month and then two days per week for the second month, followed by further reductions to 750 calories two days per week for the third month and, ultimately, 500 calories two days per week for the fourth month.

A dietitian or nutritionist should be consulted to ensure that the nutritional needs of the patient are being met.



Beneficial effects of Intermittent fasting has been demonstrated in different disease states.

Cardiovascular Disease

Intermittent fasting improves multiple indicators of cardiovascular health in animals and humans, including blood pressure; resting heart rate; levels of high-density and low-density lipoprotein (HDL and LDL) cholesterol, triglycerides, glucose, and insulin; and insulin resistance. In addition, intermittent fasting reduces markers of systemic inflammation and oxidative stress that are associated with atherosclerosis.

Cancer

Intermittent fasting is thought to impair energy metabolism in cancer cells, inhibiting their growth and rendering them susceptible to clinical treatments.

Neurodegenerative disorders

There is strong preclinical evidence that alternate day fasting can delay the onset and progression of the disease processes in animal models of Alzheimer's disease and Parkinson's disease.

Also shown beneficial effects in **Asthma, Multiple Sclerosis, and Arthritis including RA.**

Limitations

The abundance of food and extensive marketing in developed nations are major hurdles to be overcome. People are used to eating 3 meals and snacks. Also switching to an intermittent- fasting regimen, many people will experience hunger, irritability, and a reduced ability to concentrate during periods of food restriction. However, these initial side effects usually disappear within one month, and patients should be advised of this fact.

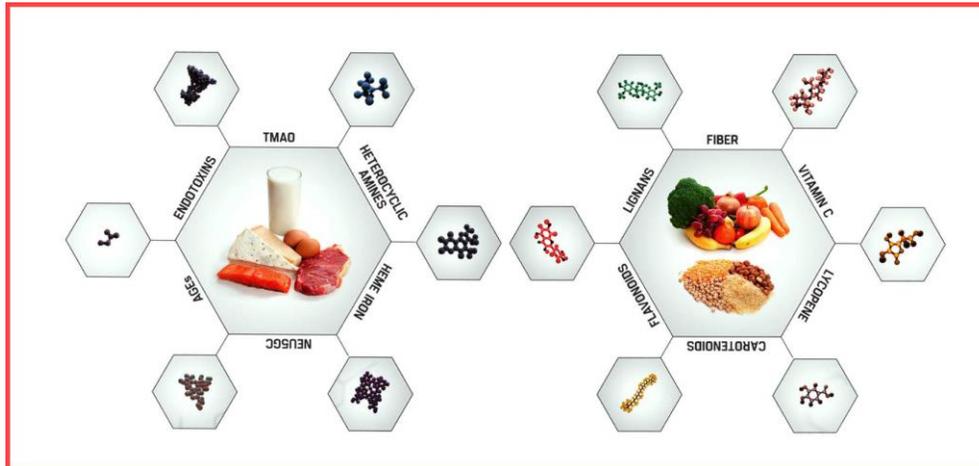
Vegan/Plant based diet

A plant-based diet, which emphasizes fruits, vegetables, grains, beans, legumes and nuts, is rich in fiber, vitamins and other nutrients.

The preponderance of scientific evidence suggests that an animal-based diet — where foods like meat, eggs and dairy are the foundation of most meals — decreases overall health, increases the risk of numerous diseases, and reduces our lifespans. Conversely, the more plants you eat, the healthier you tend to be, decreasing your risk of many major diseases.



Extensive research has shown that meat and other animal products, particularly red meat contain (or lead to the formation of) a wide range of pro-inflammatory compounds and molecules, including bacterial endotoxins, trimethylamine N-oxide (TMAO), nitrosamines, heterocyclic amines (HCAs), N-Glycolylneuraminic acid (Neu5Gc), and polycyclic aromatic hydrocarbons (PAHs), that can increase measures of inflammation significantly increasing risk of CV disease.



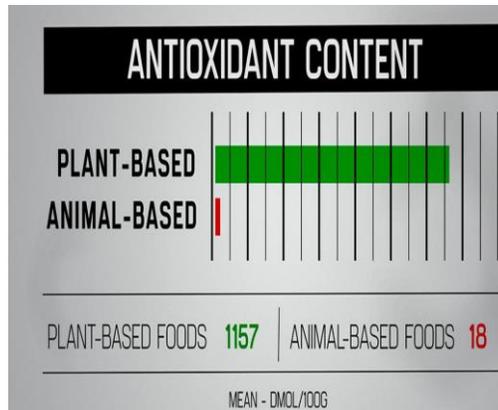
Animals vs. Plants Diet

Plants fall on the opposite end of this spectrum, coming naturally packed with high doses of anti-inflammatory compounds, and powerful antioxidants. The contrast between these two classes of food is dramatic, with plants having on average 64 times the antioxidant content of animal foods. This helps explain why switching to a plant-based diet can help reduce measures of inflammation.

As demonstrated by the athletes and research featured in *The Game Changers*, switching to a diet centered around plants can yield significant performance advantages, providing optimal fuel, increasing blood flow, making muscles more efficient, and speeding recovery by lowering inflammation.

Those seeking vegan diet, the documentary “game changers” in the series *Fork Over Knives* in Netflix may be informative, with following link to get started on vegan diet.

<https://gamechangersmovie.com/getting-started/>



Flexitarian Diet

This diet describes someone who eats mostly plant-based foods, but occasionally eats meat, poultry and fish. That kind of healthy eating is central to the Mediterranean diet — which limits red meat and emphasizes fruits, vegetables, legumes, whole grains and healthy fats — and has been shown to reduce your risk of heart disease and other chronic conditions.

Tomato
 Strawberry
 Blue berries
 Raspberries
 Oranges
 Grapefruit
 Lychee
 Lemons
 Cherries
 Red wine

Sea Food
 Tree nuts
 Apple
 Pomegranate
 Turmeric
 Nutmeg
 Green tea
 Olive oil
 Dark chocolate

Dietary Pattern that enhance stem cells

Mediterranean Diet
 Calorie restricted
 Intermittent fasting

Dietary Pattern that Harm stem cells

High salt
 High fat
 Hyperglycemic

The most prescribed diets with highest evidence to support reduction in Cardiovascular risk are the Mediterranean diet and DASH diet. They have been

linked to lower risk of mortality from Coronary artery disease and cardiovascular diseases and from all causes.

Overall patients who are aiming towards weight loss, for short-term weight loss, calories are king: this explains why nearly any diet can be effective in the short-term. Many overweight and obese patients effectively lose weight on very low-carbohydrate diets, a reasonable first choice for intensive short-term weight loss, especially among patients with insulin resistance. Once weight loss has been achieved, patients should shift back toward healthful, food-based diet patterns. The best diet is the one the patient can implement and sustain.

Food Constituents

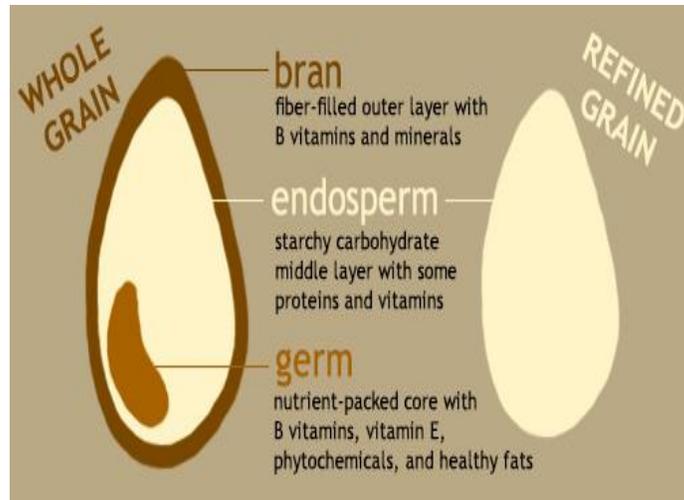
Carbohydrates: Whole grains:

The 2015-2020 Dietary Guidelines for Americans recommends eating 6 ounces of grain foods daily (based on a 2000-calorie diet) and getting at least half or 3 ounces of that grain intake from 100% whole grains.

Amaranth	Kamut	Spelt
Barley	Millet	Teff
Brown Rice	Quinoa	Triticale
Buckwheat	Rye	Wheat Berries
Bulgur	Oats	Wild Rice
Corn	Sorghum	

Whole grain intake is associated with a substantially lower risk of CVD, whereas refined grain intake is suggestive of an increased risk. The bran and germ layers, present in whole grains, but removed from refined grains, are rich in fiber, lignans, micronutrients, fatty acids, and other phytonutrients.





There is inconsistent food labeling means that foods identified as “whole grain” are not always healthy. The five USDA criteria that identify whole grains in a food product: 1) any whole grain as the first ingredient, 2) any whole grain as the first ingredient, and added sugars not being one of the first three ingredients in the ingredient list, 3) the word “whole” before any grain ingredient, 4) a carbohydrate-to-fiber ratio of less than 10:1, and 5) the industry-sponsored Whole Grain Stamp. Dietary fiber has been consistently demonstrated to lower risk of CVD. In a meta-analysis of 22 cohorts, a 7-g/day increase in fiber intake was associated with a 9% decrease in CHD incidence. It is shown to reduce all-cause mortality among MI survivors, and cardioprotective action of fiber operates through decreased LDL, decreased serum triglycerides, blunted postprandial glucose response, and changes in bile acid metabolism

PROTEINS:

The National Academy of Medicine recommends that adults get a minimum of 0.8 grams of protein for every kilogram of body weight per day, or **just over 7 grams for every 20 pounds of body weight.**

However, not all protein “packages” are created equal. Because foods contain a lot more than protein, it’s important to pay attention to what else is coming with it.

Get your protein from plants when possible.

- **Legumes:** [lentils](#), beans (adzuki, black, fava, [chickpeas](#)/garbanzo, kidney, lima, mung, pinto etc.), peas (green, snow, snap, split, etc.), edamame/soybeans (and products made from [soy](#): tofu, tempeh, etc.), peanuts.

- **Nuts and Seeds:** [almonds](#), pistachios, cashews, walnuts, hazelnuts, pecans, hemp seeds, squash and pumpkin seeds, sunflower seeds, flax seeds, sesame seeds, [chia seeds](#).
- **Whole Grains:** kamut, teff, wheat, [quinoa](#), [rice](#), wild rice, millet, [oats](#), buckwheat,
- **Other:** while many [vegetables and fruits](#) contain some level of protein, it's generally in smaller amounts than the other plant-based foods. Some examples with higher protein quantities include corn, broccoli, asparagus, [brussels sprouts](#), and artichokes.

Among animal proteins **choose fish, poultry, limit red meat and cheese, avoid bacon, cold cuts, and other processed meats.**

Fats and Cholesterol

When it comes to dietary fat, what matters most is the type of fat you eat. Contrary to past dietary advice promoting [low-fat diets](#), newer research shows that healthy fats are necessary and beneficial for health.

Findings from the Nurses' Health Study and the Health Professionals Follow-up Study show that no link between the overall percentage of calories from fat and any important health outcome, including cancer, heart disease, and weight gain.

Fat is an important part of a healthy diet. Choose foods with "good" unsaturated fats, limit foods high in saturated fat, and avoid "bad" trans-fat.

- **"Good" unsaturated fats** — Monounsaturated and polyunsaturated fats — lower disease risk. Foods high in good fats include vegetable oils (such as olive, canola, sunflower, soy, and corn), nuts, seeds, and fish. Extra virgin olive oil is the healthiest kind of olive oil because it contains natural chemical compounds known as phenols or polyphenols that provide a host of health benefits including decreased blood pressure, lower inflammation, higher levels of HDL (good) cholesterol and improved HDL function. More efficient use of insulin to better store glucose and improved heart health. Look for labels that indicate your oil is "extra-virgin" and ideally cold-pressed.
- **"Bad" fats** — trans fats — increase disease risk, even when eaten in small quantities. Foods containing trans fats are primarily in processed foods made with trans-fat from partially hydrogenated oil.
- **Saturated fats**, while not as harmful as trans fats, by comparison with unsaturated fats negatively impact health and are best consumed in moderation. Foods containing large amounts of saturated fat include red meat, butter, cheese, and ice cream. Some plant-based fats like [coconut oil](#) and palm oil are also rich in saturated fat.

Physical activity and exercise

I cannot possibly complete the review without emphasizing the importance of exercise on overall health including cardiometabolic health and reduction of cancer.

Physical activity is anything that gets your body moving. According to the 2018 *Physical Activity Guidelines for Americans*, 2nd edition, adults need to do two types of physical activity each week to improve their health— aerobic activity and muscle strengthening.

Recommendations for Adults

- Get at least **150 minutes per week** of moderate-intensity aerobic activity or 75 minutes per week of vigorous aerobic activity, or a combination of both, preferably spread throughout the week.
- Add moderate- to high-intensity muscle-strengthening activity (such as resistance or weights) on at least 2 days per week.
- Spend less time sitting. Even light-intensity activity can offset some of the risks of being sedentary.
- Gain even more benefits by being active at least 300 minutes (5 hours) per week.
- Increase amount and intensity gradually over time

Examples of moderate-intensity aerobic activities:

- brisk walking (at least 2.5 miles per hour)
- water aerobics
- dancing (ballroom or social)
- gardening
- tennis (doubles)
- biking slower than 10 miles per hour

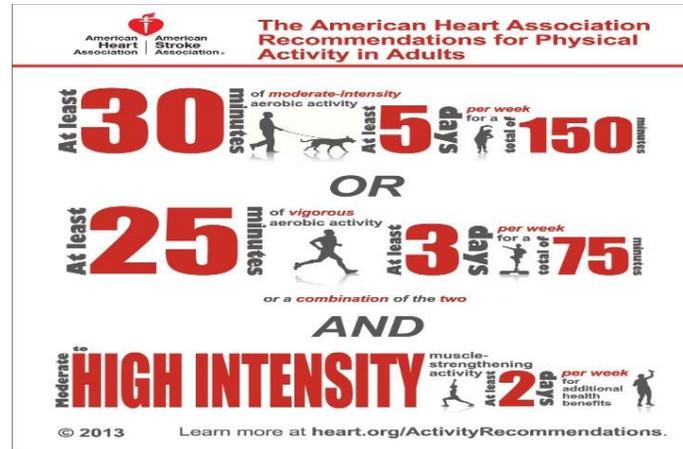
Vigorous intensity activities will push your body a little further. They will require a higher amount of effort. You'll probably get warm and begin to sweat. You won't be able to talk much without getting out of breath.

Examples of vigorous-intensity aerobic activities:

- hiking uphill or with a heavy backpack
 - running
 - swimming laps
 - aerobic dancing
 - heavy yardwork like continuous digging or hoeing
- 

- tennis (singles)
- cycling 10 miles per hour or faster
- jumping rope

High Intensity Interval Training (HIIT training) **burns fat** and improves your endurance faster than other types of **workouts**. A 2017 analysis of 18 studies found that **HIIT training** was associated with larger reduction in body fat and greater improvement in **heart** and **lung fitness** in obese adults than traditional **exercise**.



Exercise Prescription

Resistance Training Guidelines:

- **F:** 2-3 non-consecutive days per week
- **I:** RPE 12-14, 8-12(+) repetitions without significant fatigue
 - Start with low resistance (<30%1RM) and progress with smallest increment possible
- **T:** 1-3 sets, 8-10 exercises targeting major muscle groups
 - 30 second to 3 minute rest between sets
- **T:** Free weights, resistance machines, resistance bands, or body weight exercises

Rebe et al. ACSM's Guidelines for Exercise Testing and Prescription 2018, 305.

High-Intensity Aerobic Interval Training

- Demonstrated to result in more rapid and greater improvements in peak $\dot{V}O_2$ and other measures of cardiovascular health than traditional continuous intensity training²
- High-intensity aerobic interval training (HIIT) involves alternating 10 seconds to 5 minutes of more intense training (85%-95% of peak heart rate, RPE 15-17) interspersed with 1 to 3(+) minutes of moderate training during an exercise session.¹
- HIIT is relative.
- Real-world applicability

1. Squires et al. J Cardiopulm Rehabil Prev. 2016; 38: 139-146.
2. Waijaff et al. Circulation. 2007; 115: 3086-3094.

In a study published in the *British Journal of Sports Medicine*, European and Australian researchers find that not all types of physical activity are equal when it comes to longevity. They studied data collected from more than 80,000 people in England and Scotland who answered questions about their activity levels yearly between 1994 and 2008. The data showed that people who engaged in three types

of exercise—racquet sports like tennis or racquet ball, swimming and aerobics—had the lowest risk of dying during the study period.

Important Considerations

An often under-emphasized component of an exercise prescription progression.

Inadequate patient progression strategies may:

- limit the benefits of exercise training
- give patients an impression that higher training loads are dangerous and to be avoided
- result in a self-perceived state of debility

Progression at too rapid a rate, however, may result in adverse effects. There is no evidence that an overly cautious approach to exercise progression in cardiac rehabilitation settings is prudent.

Squires et al Cardiopulmonary rehab prevention 2018

Recommendations for Kids

- Children 3-5 years old should be physically active and have plenty of opportunities to move throughout the day.
- Kids 6-17 years old should get at least 60 minutes per day of moderate- to vigorous-intensity physical activity, mostly aerobic.
- Include vigorous-intensity activity on at least 3 days per week.
- Include muscle- and bone-strengthening (weight-bearing) activities on at least 3 days per week.
- Increase amount and intensity gradually over time.



References

1. Diet and Heart Disease— Mozaffarian, MD 2016 **JACC**
2. Effects of Intermittent Fasting on Health, Aging, and Disease NEJM 2019 Rafael de Cabo, Ph.D., and Mark P. Mattson, Ph.D.
3. Cardiovascular Disease Prevention by Diet Modification Edward Yu et al JACC [August 2018](#)
4. Ketogenic diet: What are the risks? U Chicago-Natalie Helms
5. What Should I Eat? Nutritional Source Harvard TH Chan School of public health
6. Evidence from a broad range of research paradigms demonstrates that the focus should be on healthful food-based diet patterns, including increased intakes of beneficial foods such as fruits, nuts, vegetables, minimally processed whole grains, legumes, polyunsaturated and phenolic-rich vegetable oils, seafood, yogurt, and reduced intakes of sugar-sweetened beverages, processed meats, and foods rich in refined grains, starches, and sugars. Historical prioritization on reducing total fat, saturated fat, and dietary cholesterol is outdated and incomplete.

