

REDUCING DIETARY CARBOHYDRATE

HEALTH BENEFIT OR HEALTH RISK

Scientific blog written by Prof Grant Schofield; brief practical application piece to finish by Prof and Dietitian Caryn Zinn.

Discussing the science: Prof Grant Schofield

I want to discuss two recent headlines...

Headline 1: *A low carb diet can increase your risk of mortality by up to 38% each year*



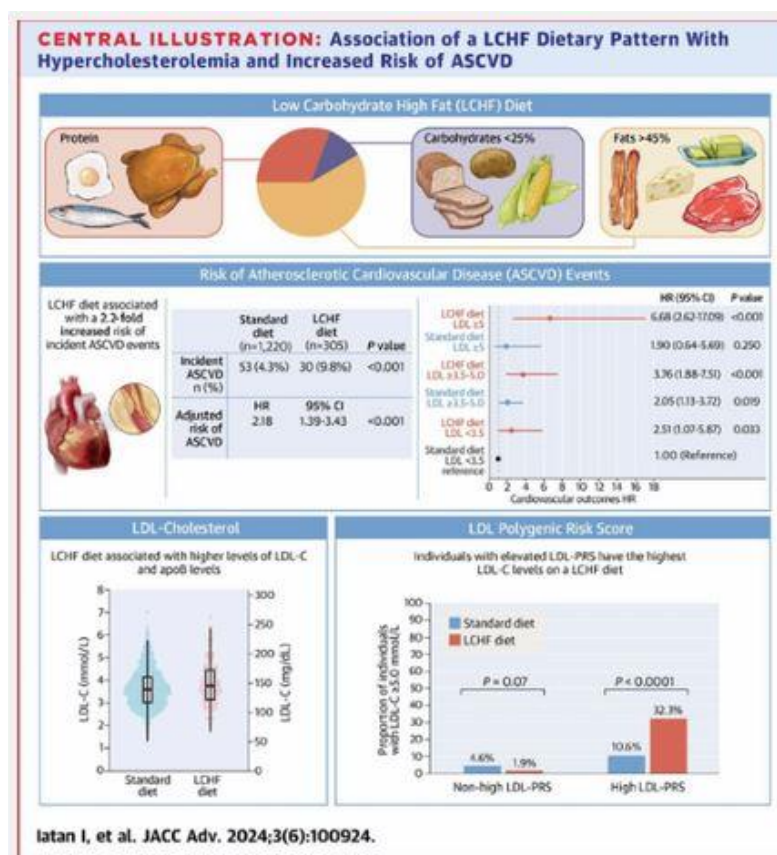
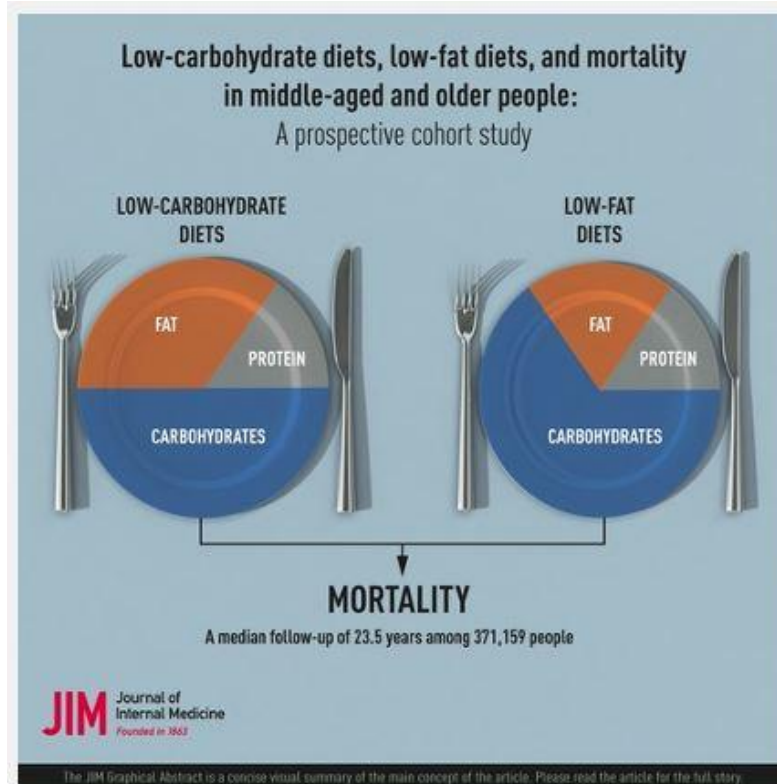
Headline 2: *'Keto-like' diet may be associated with a higher risk of heart disease, according to new research.*



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Here are the actual study graphical abstracts



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The actual findings of the studies: A paper in the Journal of [Internal Medicine](#) shows that both lower carb and higher carb diets in two US cohorts were associated with increased mortality risk. Yet the “low carb” definition resembles nothing we conventionally think of as “low carb”.

A [paper in the Journal of the American College of Cardiology \(JACC\)](#) shows that in the UK Biobank studied people with low carb diet patterns, self-reported who were also 3 x more diabetic and more obese to start with. Nonetheless after just under 12 years of follow up the 305 low carbers compared with the 1220 standard diet eaters (no measure of diet quality) had almost twice the risk of a major adverse cardiac event.

They had higher CVD risk factors at baseline, which were statistically accounted for. Although experimentally when people are put on low carb diets this is the exact opposite of what you actually see.

So, what should we make of these 2024 headlines?

What role does dietary carbohydrate and fat have in our health and longevity?

The actual totality of the evidence that we need to look at is very different again.

In this article I want to step you through the logic and actual evidence as it currently stands for giving dietary advice around macro-nutrients in general and then specifically for lowering carb intake.

Two schools of thought

There have been two schools of scientific argument over the last 50 years in nutrition and health.

We have the diet-heart hypothesis, and its more specific lipid hypothesis. This comes out of Ancel Keys' work in the 1960s and 70s which claimed that dietary fat, especially animal fat sources are a primary and important cause of coronary artery disease and all other vascular diseases.

The diet-heart hypothesis

The main points go something like this:

Fat in the diet, specifically saturated fat, raises low density lipoproteins (LDL). These raised levels are directly causal in the formation of arthro-sclerotic plaques in the vascular systems.

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Because heart disease and associated vascular diseases are the most important cause of early death and to some extent disability then we need to advise people to eat less animal fat. A secondary effect is that fat is more than twice as energy dense as protein and carbohydrate so it might be easier to overeat fat calories and get fat than the macronutrients.

That led to the low-fat revolution and food pyramid advice for public health. These still form the overall basis for most dietary advice, although moderate fat consumption is now preferred over low-fat consumption. There is still strong advice to limit calories from saturated fat.

Counter arguments are:

1. Although LDL is high at the site of atherosclerotic plaques, they are there to repair damage caused by other factors. Chronic inflammation is the major cause of vascular damage. In from there is a trilogy of multidirectional effects of glycation, inflammation and oxidative stress caused by all sorts of factors including food, smoking, alcohol, stress and many other environmental factors. Blaming LDLc as being causative is a little bit like blaming fire trucks for causing house fires. The fact that fire trucks are at house fires doesn't mean they caused them!
2. By far and away the major important risk factors for the cluster of factors associated with the "metabolic syndrome" are dietary factors related to carbohydrate consumption, low fat consumption, and a loss of control of blood glucose and insulin resistance.
 - a. Low HDL - we can increase our HDL by eating more fat, especially animal fats. More physical activity also helps here.
 - b. High triglycerides - we can reduce our fasting TG by eating less carbohydrate and sugar. These flux through the liver and are exported as TG. Fasting TG is a good measure of how much carbohydrate people have been eating recently. This plummets when you restrict it and eat more fat. Taken together a low Fasting TG (<1.5) and HDL >2.0 is indicative of an excellent lipid profile. It proxies almost no likelihood of ApoB LDL particles which may be causative in plaque formation.
 - c. Visceral adiposity - because accumulation of fat about the waist and around the organs is an active endocrine organ secreting inflammatory cytokines, then reducing this helps your metabolic health. Returning blood glucose and insulin to homeostatic levels allows hormone-sensitive lipase

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to act as it normally should, and we can burn fat as a primary fuel source. When insulin levels are high this is not the case. Fat burning is turned off, and the resulting hyperinsulinemia interferes with the brain's ability to see leptin. This is called leptin resistance, and we cannot receive the signal to feel full and stop eating.

- d. Hypertension – high blood pressure is often described as being “essential” or “idiopathic”. By this we mean we really don't know the reason. Watching your stress, exercising more, eating less salt is often advised. These might help. What we know from first year physiology is that glucose and insulin control sodium retention at the kidney. When these are elevated, we retain more sodium. This increases blood volume and therefore blood pressure. Reducing blood glucose and normalising insulin often normalise blood pressure. This is a reason the Germans used 10-day water only fasts to treat severe hypertension.
- e. Elevated blood glucose – eating more fat, restricting carbohydrate reduces blood glucose. This seems like a simple statement “If you want to reduce the thing that puts your glucose up (carbohydrate only gets to the blood as glucose) then eat less of it”. However, modern dietary guidelines seem oblivious to this commonsense idea. Somehow, we have managed to ignore the most obvious elephant in the room – eating less of the thing that puts your blood sugar up! We ended up concentrating on dietary fat, which in the context of a whole food diet is mostly beneficial.

A better approach: A diet which normalises blood glucose and prevents the hypersecretion of insulin is likely to be the best target to reduce the risk of diet on chronic disease.

This has become, I think unfairly, a highly controversial topic in medicine and nutrition. My take is that the status quo (the diet-heart hypothesis) has become so entrenched in medicine as the mantra that the inertia to overcome this and the interest of the pharmaceutical and food industries' interest that we fail to see the forest from the trees anymore.

The research from many, many clinical trials shows benefits to carbohydrate reduction especially around metabolic syndrome and diabetes, but also for all issues which are downstream from that – obesity, all vascular and most neurological diseases, mental health, and many cancers is now startling.

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I'd summarise it like this:

1. On balance, diet quality matters. This means that animal products in diets help, and don't hinder health. High fat dairy is associated with better outcomes not worse like the lipid hypothesis predicts. If there is a plausible negative effect of red meat on health, then it is likely in the context of processed meat. Fresh red meat offers no health risk apart from too much iron to a small group which should watch this.
2. Diet quality also matters, eating less ultra processed food from any macronutrient profile is a good idea. But we should especially consider calories for sugar, starch, and processed acellular carbohydrates.
3. On balance low carb diets, high in fat and saturated fat improve metabolic profiles including the lipid profile better than other alternatives.
4. High saturated fat might affect people with familial hyperlipidemia and this might mean a moderation in saturated fat. This is a small group and eating extra carbohydrate won't improve the situation, eating extra other fat, i.e., monounsaturated fats might help.
5. Reducing dietary carbohydrate is a highly effective way to reverse the metabolic syndrome and, in many cases, reverse or put diabetes into remission. I'm not aware of any other approach except severe very low-calorie diets which are of course low carb ketogenic diets as well, which achieve the same result.
6. Reducing dietary carbohydrate can also be an effective short to medium term weight loss strategy. Like every other diet, losing weight and keeping it off in a pathological ultra-processed food environment is hard. That said, the overall number needed to treat and the number needed to harm for two-year weight loss for the [A-Z diet study](#) for a low carb approach is better than other diets (low fat, DASH and LEARN diets).

Here's what we know from the research so far. If you want to really get into the weeds of this then I refer you to Volek et al.'s 2024 review paper "[Expert consensus on nutrition and lower-carbohydrate diets: An evidence- and equity-based approach to dietary guidance](#)"

I highly recommend this paper as the "go-to" as of mid-2024 for what outcomes you can expect reasonably from prescribing carbohydrate reduced diets.

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But wait, what about the population studies? Don't they show the opposite? While the clinical trials show clearly the benefits of normalising glucose by way of eating less of it there remains controversy.

What's the controversy?

The controversy is what I opened this article with. Headlines which propose that low carb will get you to an early death.

The controversy is ecological studies. These range from large cross-sectional studies where diet and outcomes are concurrently measured to multi-country prospective studies where diets are measured at one time point and then outcomes including mortality are measured later as they occur.

Whether we should use any of these studies for anything more than forming hypotheses is a subject debate past this snippet. But the confounding of these with healthy user bias and many unknown unknowns is something to think about.

That said, here's what we know from these studies:

1. A 2024 paper "[Dietary Macronutrient Intake and Cardiovascular Disease Risk and Mortality: A Systematic Review and Dose-Response Meta-Analysis of Prospective Cohort Studies](#)" probably represents the largest collection of data from the NHANES survey 1998–2018. They conclude "This meta-analysis supports that protein intake is associated with a decreased risk of CVD morbidity, while carbohydrate intake is associated with an increased risk of CVD morbidity. High total fat intake is associated with a low risk of all-cause mortality, and this effect was different in an analysis stratified by the type of fat."
2. A [2020 paper in JAMA](#) looked at the association of Low-Carbohydrate and Low-Fat Diets With Mortality Among US Adults. They found that high quality low carb and low fat diets were associated with lower mortality, but only when the diet quality was higher.
3. Two studies in 2023, A paper in the Journal of [Internal Medicine](#) attracted huge attention which shows that both lower carb and higher fat diets in two US cohorts were associated with increased mortality risk (this is the paper cited in the headline of this article). Likewise, a [Japanese study](#) showed the same thing with a twist "An unfavorable association with mortality is observed for low-carbohydrate intake in men and for high-carbohydrate intake in women. High fat intake can be associated with a lower mortality risk in women among Japanese adults with a relatively high carbohydrate intake."

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4. A [2018 Lancet paper](#) showed in the ARIC cohort that “Both high and low percentages of carbohydrate diets were associated with increased mortality, with minimal risk observed at 50–55% carbohydrate intake.” You can also read a [2022 critique of this study also in The Lancet](#) claiming no “low carb diet was tested in the ARIC study”.
5. The PURE study results which takes 18 countries across five continents offers the biggest international data set with the most variation in eating patterns. The [2017 Lancet paper](#) concludes that “High carbohydrate intake was associated with higher risk of total mortality, whereas total fat and individual types of fat were related to lower total mortality. Total fat and types of fat were not associated with cardiovascular disease, myocardial infarction, or cardiovascular disease mortality, whereas saturated fat had an inverse association with stroke. Global dietary guidelines should be reconsidered in light of these findings.” This, of course, flies directly in the face of the diet-heart and lipid hypotheses.
6. The latest PURE study focused on diabetes is a [2024 paper in The Lancet Diabetes and Endocrinology](#). Unsurprisingly they show that “Diets with a high glycaemic index and a high glycaemic load were associated with a higher risk of incident type 2 diabetes in a multinational cohort spanning five continents. Our findings suggest that consuming low glycaemic index and low glycaemic load diets might prevent the development of type 2 diabetes.”. In other words, lower carb, and better-quality carb diets reduce your risk of diabetes.
7. Last, a [2023 paper in Diabetes Care](#) looked at mortality in diabetics and found that the healthy low carb dietary pattern was associated with lower all cause death, CVD and cancer death.

So, wow that's a lot of prospective studies which lead to a whole lot of headlines. What can we take out of it? I'm not exactly sure. But the idea that there is overwhelming evidence that low carb is a problem seems utterly unfounded.

My bottom lines:

1. Reducing dietary carbohydrate experimentally and theoretically improves all aspects of the metabolic syndrome, helps normalise blood glucose and prevent hyperinsulinemia.
2. Its effectiveness for weight loss and adherence is as good or better than other diets. It does less harm and has more benefit in clinical trials.

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3. It's not perfect and there are situations where you need to watch for familial hyperlipidemia and unhealthy applications of low carb and ultra processed foods.
4. Beware of large prospective studies which are only fit for forming hypotheses not for setting dietary guidelines.

Practical application for the unconvinced: Prof. and Dietitian Caryn Zinn

If you are still hesitant about saturated fat, that's ok. It doesn't mean that you can't adopt a reduced carbohydrate eating approach. You can still reduce your carbs, increase your protein and fat, just focus on including foods with monounsaturated fats (found in olive oil, avocado, nuts and seeds) and Omega 3 polyunsaturated fats (found in all fatty fish, eggs and some nuts and seeds like walnuts, flax, chia seeds).

Saturated fat is not a food, it's a nutrient, found in both animal and plant foods, and many foods containing it also provide other important nutrients. So, while we don't believe it's a problem per se in the context of a whole food reduced carbohydrate dietary approach, we also don't see value in purposely overdoing it either. We do not advocate that people eat blocks of butter, pour cream, melt cheese and add bacon and coconut cream to all their meals, but rather we advocate for not avoiding whole natural animal and plant foods that contain these fats. In practice, if your LDL increases (even with a favourable triglyceride and HDL outcome) and you're not comfortable with that, you can tone down the amount of saturated fat you consume to suit and substitute fats as mentioned above.