Disease Recovery
The science behind Better Therapeutics

A breakthrough intervention for recovery from diabetes, high blood pressure and high cholesterol.
Decades of clinical studies published in peer-reviewed journals prove that making significant changes in diet and lifestyle are powerful enough to enable recovery from diabetes, heart disease and other chronic conditions.
PEER REVIEWED STUDIES & ARTICLES


Katz DL. Lifestyle is the Medicine, Culture is the Spoon: The Covariance of Proposition and Preposition. Am J Lifestyle Med. 2014;8: 301-305


Micha R, Peñalvo JL, Cudhea F, Imamura F, Rehm CD, Mozaffarian D. Association Between Dietary Factors and Mortality From Heart Disease, Stroke, and Type 2 Diabetes in the United States. JAMA. 2017 Mar 7;317(9):912-924


Springmann M, Godfray HC, Rayner M, Scarborough P. Analysis and valuation of the health and climate change co-benefits of dietary change. Proc Natl Acad Sci U S A. 2016 Apr 12;113(15):4146-51

Hippocrates has been quoted so often on the topic of lifestyle medicine that his position sounds trite now: “Let food be thy medicine, and medicine be thy food.” The statement, though, is profound. Food is the fuel that runs the human machine in all its intricate complexity. High performance bodies require high performance fuel, and Hippocrates—long before the invention of other machines—seemed to understand that. He understood as well that while other “medicines” could treat disease (however poorly back in his day), no other medicine than lifestyle could support and foster health at its origins.

That, then, is the new proposition, born of an ancient pedigree: to treat disease with a medicine that can, as well, cultivate true vitality, and foster longevity, at their origins in our biology. And how fitting that Hippocrates’ time-honored wisdom should find new application in the technological advances of our modern era. We have whole new ways now to reach people, to deliver lifestyle as medicine, to help that medicine go down.

Better Therapeutics, then, is that new opportunity, powered by a particular hybrid vigor: time honored (and now scientifically validated) wisdom about what lifestyle can do, and a digital therapeutic spoon full of empowerment to help that medicine go down.

While we have had wisdom about lifestyle as medicine for millennia, it is the modern era that has provided data. We no longer need merely trust in the proposition; it has been verified.

We have known for decades, courtesy of epidemiologic research, that a very short list of lifestyle factors, with diet near or at the top—has the potential to eliminate roughly 80% of all chronic disease and premature death. What’s been missing? Effective methods to turn what we KNOW into what we DO.

When the profound impact of lifestyle factors on health outcomes was first recognized, the number 1 cause of premature death in the United States was tobacco use. Now, more than 20 years later, with fewer people smoking, everybody still eating, and the prevailing diet still so far from the ideal— it is diet. Lifestyle—diet, physical activity, avoiding toxins like tobacco and excess alcohol, getting enough sleep, dissipating stress, and nurturing strong relationships—is the most potent medicine we know, and the only one where all of the side effects are good. It is the only medicine suitable for every member of the household, all the time. It is the only medicine that can add both years to lives, and life to years; and can prevent, treat and, at times, cure chronic disease.

Lifestyle as medicine can prevent 80% or more of all heart disease, and 95% or more of all type 2 diabetes in people at high risk. It can treat and at times fully reverse these conditions.

The best diet for health—and for preventing, treating, and reversing chronic disease—is established on the basis of massive volumes of scientific evidence and the global consensus of experts. In fact, it is not a diet at all. It is a pattern of lifelong eating that consists of whole, wholesome, mostly plant foods in sensible balance and variety.

Innovations in translating what we know about lifestyle as medicine into behavior change at scale have the potential to add countless years to lives, life to years, and save vast fortunes in disease care expenditures. The effective application of lifestyle as medicine figures prominently in crossing the next great threshold for the human condition.
Peer reviewed studies & articles
Effect of a mediterranean type of diet on the rate of cardiovascular complications in patients with coronary artery disease. Insights into the cardioprotective effect of certain nutriments


J Am Coll Cardiol. 1996 Nov 1;28(5):1103-8

ABSTRACT

OBJECTIVES: We sought to describe the various cardiovascular complications that occurred in the Lyon Diet Heart Study (a secondary prevention trial testing the protective effects of a Mediterranean type of diet), to analyze their relations with the associated drug treatments and to gain insights into the possible mechanisms underlying the beneficial effects of certain nutriments.

BACKGROUND: Dietary habits are implicated in coronary heart disease, and the traditional Mediterranean diet is thought to be cardioprotective. However, the exact mechanisms of this protection are unknown.

METHODS: A total of 605 patients (303 control subjects and 302 study patients) were studied over a mean period of 27 months. Major primary end points (cardiovascular death and nonfatal acute myocardial infarction), secondary end points (including unstable angina, stroke, heart failure and embolisms) and minor end points (stable angina, need for myocardial revascularization, postangioplasty restenosis and thrombophlebitis) were analyzed separately and in combination.

RESULTS: When major primary and secondary end points were combined, there were 59 events in control subjects and 14 events in the study patients, showing a risk reduction of 76% (p < 0.0001). When these end points were combined with the minor end points, there were 104 events in control subjects and 68 events in the study patients, giving a risk reduction of 37% (p < 0.005). By observational analysis, only aspirin among the medications appeared to be significantly protective (risk ratio after adjustment for prognosis factors 0.45; 95% confidence interval 0.25 to 0.80).

CONCLUSIONS: These data show a protective effect of the Mediterranean diet. However, the risk reduction varied depending on the type of end point considered. Our hypothesis is that different pathogenetic mechanisms were responsible for the development of the various complications. It is likely that certain nutriments characteristic of the Mediterranean diet (omega-3 fatty acids, oleic acid antioxidant vitamins) have specific cardioprotective effects.
Healthy living is the best revenge: findings from the European Prospective Investigation Into Cancer and Nutrition-Potsdam study

Ford ES, Bergmann MM, Kröger J, Schienkiewitz A, Weikert C, Boeing H.

Arch Intern Med. 2009 Aug 10;169(15):1355-62

ABSTRACT

BACKGROUND: Our objective was to describe the reduction in relative risk of developing major chronic diseases such as cardiovascular disease, diabetes, and cancer associated with 4 healthy lifestyle factors among German adults.

METHODS: We used data from 23,153 German participants aged 35 to 65 years from the European Prospective Investigation Into Cancer and Nutrition-Potsdam study. End points included confirmed incident type 2 diabetes mellitus, myocardial infarction, stroke, and cancer. The 4 factors were never smoking, having a body mass index lower than 30 (calculated as weight in kilograms divided by height in meters squared), performing 3.5 h/wk or more of physical activity, and adhering to healthy dietary principles (high intake of fruits, vegetables, and whole-grain bread and low meat consumption). The 4 factors (healthy, 1 point; unhealthy, 0 points) were summed to form an index that ranged from 0 to 4.

RESULTS: During a mean follow-up of 7.8 years, 2006 participants developed new-onset diabetes (3.7%), myocardial infarction (0.9%), stroke (0.8%), or cancer (3.8%). Fewer than 4% of participants had zero healthy factors, most had 1 to 3 healthy factors, and approximately 9% had 4 factors. After adjusting for age, sex, educational status, and occupational status, the hazard ratio for developing a chronic disease decreased progressively as the number of healthy factors increased. Participants with all 4 factors at baseline had a 78% (95% confidence interval [CI], 72% to 83%) lower risk of developing a chronic disease (diabetes, 93% [95% CI, 88% to 95%]; myocardial infarction, 81% [95% CI, 47% to 93%]; stroke, 50% [95% CI, -18% to 79%]; and cancer, 36% [95% CI, 5% to 57%]) than participants without a healthy factor.

CONCLUSION: Adhering to 4 simple healthy lifestyle factors can have a strong impact on the prevention of chronic diseases.
Primary prevention and risk factor reduction in coronary heart disease mortality among working aged men and women in eastern Finland over 40 years: population based observational study


*BMJ. 2016 Mar 1;352:i721*

**ABSTRACT**

OBJECTIVE: To estimate how much changes in the main risk factors of cardiovascular disease (smoking prevalence, serum cholesterol, and systolic blood pressure) can explain the reduction in coronary heart disease mortality observed among working aged men and women in eastern Finland.

DESIGN: Population based observational study.

SETTING: Eastern Finland.

PARTICIPANTS: 34 525 men and women aged 30-59 years who participated in the national FINRISK studies between 1972 and 2012.

INTERVENTIONS: Change in main cardiovascular risk factors through population based primary prevention.

MAIN: outcome measures Predicted and observed age standardised mortality due to coronary heart disease. Predicted change was estimated with a logistic regression model using risk factor data collected in nine consecutive, population based, risk factor surveys conducted every five years since 1972. Data on observed mortality were obtained from the National Causes of Death Register.

RESULTS: During the 40 year study period, levels of the three major cardiovascular risk factors decreased except for a small increase in serum cholesterol levels between 2007 and 2012. From years 1969-1972 to 2012, coronary heart disease mortality decreased by 82% (from 643 to 118 deaths per 100 000 people) and 84% (114 to 17) among men and women aged 35-64 years, respectively. During the first 10 years of the study, changes in these three target risk factors contributed to nearly all of the observed mortality reduction. Since the mid-1980s, the observed reduction in mortality has been larger than predicted. In the last 10 years of the study, about two thirds (69% in men and 66% in women) of the reduction could be explained by changes in the three main risk factors, and the remaining third by other factors.
CONCLUSION: Reductions in disease burden and mortality due to coronary heart disease can be achieved through the use of population based primary prevention programmes. Secondary prevention among high risk individuals and treatment of acute events of coronary heart disease could confer additional benefit.
Lifestyle as Medicine: The Case for a True Health Initiative
Katz DL, Frates EP, Bonnet JP, Gupta SK, Vartiainen E, Carmona RH.
Am J Health Promot. 2017 Jan 1:890117117705949

ABSTRACT
The power of lifestyle as medicine was perceived thousands of years ago. There is now consistent and compelling science to support the important influence of lifestyle on health. Approximately 80% of chronic disease and premature death could be prevented by not smoking, being physically active, and adhering to a healthful dietary pattern. Cardiovascular disease, diabetes, stroke, dementia, and cancer are all influenced by lifestyle choices. Despite the ample evidence about what behaviors promote health, confusion still prevails among the general population. This is particularly true with regard to diet. Confusing nutrition messages from scientists, the media, the food industry, and other sources have made it all but impossible for any single authority to convey persuasively the fundamentals of healthful eating. The case is made here that a global coalition of diverse experts has the power to do what no individual can: clarify and popularize an understanding of the fundamentals of a health-promoting, sustainable pattern of diet and lifestyle, and rally the general public to their consistent support.

PDF Available at: https://www.ncbi.nlm.nih.gov/pubmed/28523941
Can we say what diet is best for health?

Katz DL, Meller S.


ABSTRACT

Diet is established among the most important influences on health in modern societies. Injudicious diet figures among the leading causes of premature death and chronic disease. Optimal eating is associated with increased life expectancy, dramatic reduction in lifetime risk of all chronic disease, and amelioration of gene expression. In this context, claims abound for the competitive merits of various diets relative to one another. Whereas such claims, particularly when attached to commercial interests, emphasize distinctions, the fundamentals of virtually all eating patterns associated with meaningful evidence of health benefit overlap substantially. There have been no rigorous, long-term studies comparing contenders for best diet laurels using methodology that precludes bias and confounding, and for many reasons such studies are unlikely. In the absence of such direct comparisons, claims for the established superiority of any one specific diet over others are exaggerated. The weight of evidence strongly supports a theme of healthful eating while allowing for variations on that theme. A diet of minimally processed foods close to nature, predominantly plants, is decisively associated with health promotion and disease prevention and is consistent with the salient components of seemingly distinct dietary approaches. Efforts to improve public health through diet are forestalled not for want of knowledge about the optimal feeding of Homo sapiens but for distractions associated with exaggerated claims, and our failure to convert what we reliably know into what we routinely do. Knowledge in this case is not, as of yet, power; would that it were so.
Lifestyle is the Medicine, Culture is the Spoon: The Covariance of Proposition and Preposition

Katz DL.

*Am J Lifestyle Med.* 2014;8: 301-305

**ABSTRACT**

We have known now for a span of decades that the leading causes of premature death and chronic disease in the United States and increasingly around the world are behavioral factors under our potential control. We have as well consistent evidence from diverse sources indicating that amelioration of a short list of such factors, with an emphasis on dietary pattern, physical activity, and tobacco use, can slash rates of chronic disease and premature death alike. But choices people make are governed ultimately by choices people have. In an obesigenic and morbidigenic environment that conspires mightily against healthful living, salutary behavior change is all too often forestalled. Constructive and compassionate guidance from clinicians can help confront this challenge, and the case is made that lifestyle in medicine is of real value. But the case is also made that lifestyle is not fundamentally a clinical issue but a cultural one. For the full promise of lifestyle medicine to be realized, it must be lifestyle as medicine—and spoons full of cultural change will be required to make that medicine go down.

PDF Available at: http://journals.sagepub.com/doi/abs/10.1177/1559827614527720
Life and death, knowledge and power: why knowing what matters is not what’s the matter

Katz DL.

Arch Intern Med. 2009 Aug 10;169(15):1362-3

ABSTRACT

For a span of decades prior to 1993, when asked what is the leading cause of death in the United States, there was only one reasonable answer—heart disease. The answers for the second, third, and fourth leading causes were similarly circumscribed: cancer, stroke, and diabetes. But in that year, McGinnis and Foege1 refashioned our understanding and forever changed these answers with the publication of their seminal article, “Actual Causes of Death in the United States.” As of 1993, the leading cause of death in the United States became tobacco use.

McGinnis and Foege1 looked beyond the diseases that are proximal causes of death to the causes of those diseases, the root causes of death. They concluded that half of the annual mortality toll in this country—roughly a million deaths—was premature. These deaths could be prevented, or more accurately, deferred, with the modification of just 10 behaviors subject to our will: tobacco use, dietary pattern, physical activity level, alcohol consumption, exposure to microbial agents, exposure to toxic agents, use of firearms, sexual behavior, motor vehicle crashes, and illicit use of drugs. That list of 10 was, in turn, much dominated by the top 3—tobacco use, dietary pattern, and physical activity level—which alone accounted for nearly 800 000 premature deaths in 1990.

In 2004, Mokdad and colleagues2 at the Centers for Disease Control and Prevention, again publishing in JAMA, refreshed this perspective. Despite a decade of awareness, the same 10 modifiable behaviors, dominated by the same 3, persisted as leading causes of both premature death and chronic disease. If ever a matter of public importance belied the notion that knowledge is power, this decade of underutilized knowledge was it. And if we are once again to be updated in 2013, there is little cause to think, based on our progress to date, that we will have fared much better across an informed expanse of 2 decades, although progress in tobacco control warrants honorable mention.

It is in this context that the findings of Ford et al should be considered. In a cohort of over 23 000 German adults enrolled into the expansive EPIC study, a mere 4 behaviors accounted for a 78% variance in the apparent risk of a serious chronic disease. Since 1 of the 4 (maintenance of a BMI 30) is not a behavior per se, but rather largely a by-product of 2 other behaviors already on the list (eating well and being active) the difference between life and death and health and illness is substantially dictated by just 3 behaviors. Those 3 (smoking, diet, and physical activity) are the familiar levers of destiny McGinnis and Foege1 handed us 16 years ago.
In the study by Ford et al, for those with all 4 “healthy behaviors” compared with those with none, the hazard ratio for diabetes, myocardial infarction, stroke, or cancer was a mere 0.22, with an impressively narrow 95% confidence interval from 0.17 to 0.28. On average, the presence of just 1 healthy behavior as compared with none cut the chronic disease risk fully in half (aHR, 0.51; 95% CI, 0.43-0.60).

The authors cite a number of studies that have associated healthful living with longevity, reduced risk of various chronic diseases, and less risk of premature mortality; still more have been published since their article went to press. The point estimates, confidence intervals, and measured components of a “health-promoting” lifestyle vary, but this variation is far less important than the consistency of the take-away message. In whatever reasonable way living healthfully is cataloged and health outcomes are captured, the latter improve when the former is practiced.

The hegemony of lifestyle over health warrants particular attention at the dawn of the genomic age. The hope held out for pharmacogenomic and nutrigenomic advances may to some extent be realized. But such hope should not divert us from clear and present opportunities. We have studies to show that even gene expression submits to the power of lifestyle. Thus, the perennial debate of nature vs nurture describes a false dichotomy. With the knowledge we have already in hand, we can nurture nature.

Any devilry in the methodological details of the article by Ford et al is minor. This was an observational study, and thus the association between behaviors and outcomes was merely that, not a decisive case of cause and effect. The measure of dietary quality (variation in fruit, vegetable, and whole grain intake) was rather crude, although probably adequate. A more robust measure, such as the Alternate Healthy Eating Index, might have offered better discrimination. Finer discrimination of dietary quality might be expected to fortify the observed association between lifestyle and health outcomes. That is true as well for the elimination of error introduced by the self-reporting of diet and physical activity. If there is any bias here, it is likely bias toward the null. The dominion of lifestyle factors over health may be, if anything, even greater than reported.

Important as this article is, it nominally recasts and fundamentally reaffirms what we already knew. A catalog of factors that hold sway over both years in life and life in years is rarefied knowledge. But only the capacity to shift those still in the path of outrageous fortune from here to there is power. By and large, we lack that power—and that is what’s the matter. The one true limitation of this study is that it teaches us nothing about how to get those not already choosing health on their own to join with those who are.

Ford and colleagues have offered us yet another glimpse of a public health promised land. For all concerned with the human condition, the arduous traverse from here to there, from knowledge of what most matters to health to the power of its application, beckons. Across an expanse of policies, practices, programs, personal responsibility, and political will yet to be mustered and in some cases yet to be devised—we have miles to go before we sleep.
Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin

Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, Nathan DM; Diabetes Prevention Program Research Group.


**ABSTRACT**

**BACKGROUND:** Type 2 diabetes affects approximately 8 percent of adults in the United States. Some risk factors — elevated plasma glucose concentrations in the fasting state and after an oral glucose load, overweight, and a sedentary lifestyle — are potentially reversible. We hypothesized that modifying these factors with a lifestyle-intervention program or the administration of metformin would prevent or delay the development of diabetes.

**METHODS:** We randomly assigned 3234 nondiabetic persons with elevated fasting and post-load plasma glucose concentrations to placebo, metformin (850 mg twice daily), or a lifestyle-modification program with the goals of at least a 7 percent weight loss and at least 150 minutes of physical activity per week. The mean age of the participants was 51 years, and the mean body-mass index (the weight in kilograms divided by the square of the height in meters) was 34.0; 68 percent were women, and 45 percent were members of minority groups.

**RESULTS:** The average follow-up was 2.8 years. The incidence of diabetes was 11.0, 7.8, and 4.8 cases per 100 person-years in the placebo, metformin, and lifestyle groups, respectively. The lifestyle intervention reduced the incidence by 58 percent (95 percent confidence interval, 48 to 66 percent) and metformin by 31 percent (95 percent confidence interval, 17 to 43 percent), as compared with placebo; the lifestyle intervention was significantly more effective than metformin. To prevent one case of diabetes during a period of three years, 6.9 persons would have to participate in the lifestyle-intervention program, and 13.9 would have to receive metformin.

**CONCLUSIONS:** Lifestyle changes and treatment with metformin both reduced the incidence of diabetes in persons at high risk. The lifestyle intervention was more effective than metformin.

Prevention and management of type 2 diabetes: dietary components and nutritional strategies
Ley SH, Hamdy O, Mohan V, Hu FB.

ABSTRACT
In the past couple of decades, evidence from prospective observational studies and clinical trials has converged to support the importance of individual nutrients, foods, and dietary patterns in the prevention and management of type 2 diabetes. The quality of dietary fats and carbohydrates consumed is more crucial than is the quantity of these macronutrients. Diets rich in wholegrains, fruits, vegetables, legumes, and nuts; moderate in alcohol consumption; and lower in refined grains, red or processed meats, and sugar-sweetened beverages have been shown to reduce the risk of diabetes and improve glycaemic control and blood lipids in patients with diabetes. With an emphasis on overall diet quality, several dietary patterns such as Mediterranean, low glycaemic index, moderately low carbohydrate, and vegetarian diets can be tailored to personal and cultural food preferences and appropriate calorie needs for weight control and diabetes prevention and management. Although much progress has been made in development and implementation of evidence-based nutrition recommendations in developed countries, concerted worldwide efforts and policies are warranted to alleviate regional disparities.
Actual causes of death in the United States
McGinnis JM, Foege WH.
JAMA. 1993 Nov 10;270(18):2207-12

ABSTRACT

OBJECTIVE: To identify and quantify the major external (nongenetic) factors that contribute to death in the United States.

DATA SOURCES: Articles published between 1977 and 1993 were identified through MEDLINE searches, reference citations, and expert consultation. Government reports and complications of vital statistics and surveillance data were also obtained.

STUDY SELECTION: Sources selected were those that were often cited and those that indicated a quantitative assessment of the relative contributions of various factors to mortality and morbidity.

DATA EXTRACTION: Data used were those for which specific methodological assumptions were stated. A table quantifying the contributions of leading factors was constructed using actual counts, generally accepted estimates, and calculated estimates that were developed by summing various individual estimates and correcting to avoid double counting. For the factors of greatest complexity and uncertainty (diet and activity patterns and toxic agents), a conservative approach was taken by choosing the lower boundaries of the various estimates.

DATA SYNTHESIS: The most prominent contributors to mortality in the United States in 1990 were tobacco (an estimated 400,000 deaths), diet and activity patterns (300,000), alcohol (100,000), microbial agents (90,000), toxic agents (60,000), firearms (35,000), sexual behavior (30,000), motor vehicles (25,000), and illicit use of drugs (20,000). Socioeconomic status and access to medical care are also important contributors, but difficult to quantify independent of the other factors cited. Because the studies reviewed used different approaches to derive estimates, the stated numbers should be viewed as first approximations.

CONCLUSIONS: Approximately half of all deaths that occurred in 1990 could be attributed to the factors identified. Although no attempt was made to further quantify the impact of these factors on morbidity and quality of life, the public health burden they impose is considerable and offers guidance for shaping health policy priorities.

PDF Available at: https://www.ncbi.nlm.nih.gov/pubmed/8411605
Association Between Dietary Factors and Mortality From Heart Disease, Stroke, and Type 2 Diabetes in the United States

Micha R, Peñalvo JL, Cudhea F, Imamura F, Rehm CD, Mozaffarian D.

JAMA. 2017 Mar 7;317(9):912-924

ABSTRACT

IMPORTANCE: In the United States, national associations of individual dietary factors with specific cardiometabolic diseases are not well established.

OBJECTIVE: To estimate associations of intake of 10 specific dietary factors with mortality due to heart disease, stroke, and type 2 diabetes (cardiometabolic mortality) among US adults.

DESIGN, SETTING, AND PARTICIPANTS: A comparative risk assessment model incorporated data and corresponding uncertainty on population demographics and dietary habits from National Health and Nutrition Examination Surveys (1999-2002: n = 8104; 2009-2012: n = 8516); estimated associations of diet and disease from meta-analyses of prospective studies and clinical trials with validity analyses to assess potential bias; and estimated disease-specific national mortality from the National Center for Health Statistics.

EXPOSURES: Consumption of 10 foods/nutrients associated with cardiometabolic diseases: fruits, vegetables, nuts/seeds, whole grains, unprocessed red meats, processed meats, sugar-sweetened beverages (SSBs), polyunsaturated fats, seafood omega-3 fats, and sodium.

MAIN OUTCOMES AND MEASURES: Estimated absolute and percentage mortality due to heart disease, stroke, and type 2 diabetes in 2012. Disease-specific and demographic-specific (age, sex, race, and education) mortality and trends between 2002 and 2012 were also evaluated.

RESULTS: In 2012, 702 308 cardiometabolic deaths occurred in US adults, including 506 100 from heart disease (371 266 coronary heart disease, 35 019 hypertensive heart disease, and 99 815 other cardiovascular disease), 128 294 from stroke (16 125 ischemic, 32 591 hemorrhagic, and 79 578 other), and 67 914 from type 2 diabetes. Of these, an estimated 318 656 (95% uncertainty interval [UI], 306 064-329 755; 45.4%) cardiometabolic deaths per year were associated with suboptimal...
intakes-48.6% (95% UI, 46.2%-50.9%) of cardiometabolic deaths in men and 41.8% (95% UI, 39.3%-44.2%) in women; 64.2% (95% UI, 60.6%-67.9%) at younger ages (25-34 years) and 35.7% (95% UI, 33.1%-38.1%) at older ages (≥75 years); 53.1% (95% UI, 51.6%-54.8%) among blacks, 50.0% (95% UI, 48.2%-51.8%) among Hispanics, and 42.8% (95% UI, 40.9%-44.5%) among whites; and 46.8% (95% UI, 44.9%-48.7%) among lower-, 45.7% (95% UI, 44.2%-47.4%) among medium-, and 39.1% (95% UI, 37.2%-41.2%) among higher-educated individuals. The largest numbers of estimated diet-related cardiometabolic deaths were related to high sodium (66 508 deaths in 2012; 9.5% of all cardiometabolic deaths), low nuts/seeds (59 374; 8.5%), high processed meats (57 766; 8.2%), low seafood omega-3 fats (54 626; 7.8%), low vegetables (53 410; 7.6%), low fruits (52 547; 7.5%), and high SSBs (51 694; 7.4%). Between 2002 and 2012, population-adjusted US cardiometabolic deaths per year decreased by 26.5%. The greatest decline was associated with insufficient polyunsaturated fats (-20.8% relative change [95% UI, -18.5% to -22.8%]), nuts/seeds (-18.0% [95% UI, -14.6% to -21.0%]), and excess SSBs (-14.5% [95% UI, -12.0% to -16.9%]). The greatest increase was associated with unprocessed red meats (+14.4% [95% UI, 9.1%-19.5%]).

CONCLUSIONS AND RELEVANCE: Dietary factors were estimated to be associated with a substantial proportion of deaths from heart disease, stroke, and type 2 diabetes. These results should help identify priorities, guide public health planning, and inform strategies to alter dietary habits and improve health.
Actual causes of death in the United States, 2000
Mokdad AH, Marks JS, Stroup DF, Gerberding JL.
JAMA. 2004 Mar 10;291(10):1238-45

ABSTRACT

CONTEXT: Modifiable behavioral risk factors are leading causes of mortality in the United States. Quantifying these will provide insight into the effects of recent trends and the implications of missed prevention opportunities.

OBJECTIVES: To identify and quantify the leading causes of mortality in the United States.

DESIGN: Comprehensive MEDLINE search of English-language articles that identified epidemiological, clinical, and laboratory studies linking risk behaviors and mortality. The search was initially restricted to articles published during or after 1990, but we later included relevant articles published in 1980 to December 31, 2002. Prevalence and relative risk were identified during the literature search. We used 2000 mortality data reported to the Centers for Disease Control and Prevention to identify the causes and number of deaths. The estimates of cause of death were computed by multiplying estimates of the cause-attributable fraction of preventable deaths with the total mortality data.

MAIN OUTCOME MEASURES: Actual causes of death.

RESULTS: The leading causes of death in 2000 were tobacco (435,000 deaths; 18.1% of total US deaths), poor diet and physical inactivity (365,000 deaths; 15.2%) [corrected], and alcohol consumption (85,000 deaths; 3.5%). Other actual causes of death were microbial agents (75,000), toxic agents (55,000), motor vehicle crashes (43,000), incidents involving firearms (29,000), sexual behaviors (20,000), and illicit use of drugs (17,000).

CONCLUSIONS: These analyses show that smoking remains the leading cause of mortality. However, poor diet and physical inactivity may soon overtake tobacco as the leading cause of death. These findings, along with escalating health care costs and aging population, argue persuasively that the need to establish a more preventive orientation in the US health care and public health systems has become more urgent.
Disease Recovery: The science behind Better Therapeutics

Dietary and Policy Priorities for Cardiovascular Disease, Diabetes, and Obesity: A Comprehensive Review

Mozaffarian D.

Circulation. 2016 Jan 12;133(2):187-225

ABSTRACT

Suboptimal nutrition is a leading cause of poor health. Nutrition and policy science have advanced rapidly, creating confusion yet also providing powerful opportunities to reduce the adverse health and economic impacts of poor diets. This review considers the history, new evidence, controversies, and corresponding lessons for modern dietary and policy priorities for cardiovascular diseases, obesity, and diabetes mellitus. Major identified themes include the importance of evaluating the full diversity of diet-related risk pathways, not only blood lipids or obesity; focusing on foods and overall diet patterns, rather than single isolated nutrients; recognizing the complex influences of different foods on long-term weight regulation, rather than simply counting calories; and characterizing and implementing evidence-based strategies, including policy approaches, for lifestyle change. Evidence-informed dietary priorities include increased fruits, nonstarchy vegetables, nuts, legumes, fish, vegetable oils, yogurt, and minimally processed whole grains; and fewer red meats, processed (eg, sodium-preserved) meats, and foods rich in refined grains, starch, added sugars, salt, and trans fat. More investigation is needed on the cardiometabolic effects of phenolics, dairy fat, probiotics, fermentation, coffee, tea, cocoa, eggs, specific vegetable and tropical oils, vitamin D, individual fatty acids, and diet-microbiome interactions. Little evidence to date supports the cardiometabolic relevance of other popular priorities: eg, local, organic, grass-fed, farmed/wild, or non-genetically modified. Evidence-based personalized nutrition appears to depend more on nongenetic characteristics (eg, physical activity, abdominal adiposity, gender, socioeconomic status, culture) than genetic factors. Food choices must be strongly supported by clinical behavior change efforts, health systems reforms, novel technologies, and robust policy strategies targeting economic incentives, schools and workplaces, neighborhood environments, and the food system. Scientific advances provide crucial new insights on optimal targets and best practices to reduce the burdens of diet-related cardiometabolic diseases.

PDF Available at: https://www.ncbi.nlm.nih.gov/pubmed/26746178
Increased telomerase activity and comprehensive lifestyle changes: a pilot study
Lancet Oncol. 2008 Nov;9(11):1048-57

ABSTRACT

BACKGROUND: Telomeres are protective DNA-protein complexes at the end of linear chromosomes that promote chromosomal stability. Telomere shortness in human beings is emerging as a prognostic marker of disease risk, progression, and premature mortality in many types of cancer, including breast, prostate, colorectal, bladder, head and neck, lung, and renal cell. Telomere shortening is counteracted by the cellular enzyme telomerase. Lifestyle factors known to promote cancer and cardiovascular disease might also adversely affect telomerase function. However, previous studies have not addressed whether improvements in nutrition and lifestyle are associated with increases in telomerase activity. We aimed to assess whether 3 months of intensive lifestyle changes increased telomerase activity in peripheral blood mononuclear cells (PBMC).

METHODS: 30 men with biopsy-diagnosed low-risk prostate cancer were asked to make comprehensive lifestyle changes. The primary endpoint was telomerase enzymatic activity per viable cell, measured at baseline and after 3 months. 24 patients had sufficient PBMCs needed for longitudinal analysis. This study is registered on the ClinicalTrials.gov website, number NCT00739791.

FINDINGS: PBMC telomerase activity expressed as natural logarithms increased from 2.00 (SD 0.44) to 2.22 (SD 0.49; p=0.031). Raw values of telomerase increased from 8.05 (SD 3.50) standard arbitrary units to 10.38 (SD 6.01) standard arbitrary units. The increases in telomerase activity were significantly associated with decreases in low-density lipoprotein (LDL) cholesterol (r=-0.36, p=0.041) and decreases in psychological distress (r=-0.35, p=0.047).

INTERPRETATION: Comprehensive lifestyle changes significantly increase telomerase activity and consequently telomere maintenance capacity in human immune-system cells. Given this finding and the pilot nature of this study, we report these increases in telomerase activity as a significant association rather than inferring causation. Larger randomised controlled trials are warranted to confirm the findings of this study.

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Changes in prostate gene expression in men undergoing an intensive nutrition and lifestyle intervention


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ABSTRACT

Epidemiological and prospective studies indicate that comprehensive lifestyle changes may modify the progression of prostate cancer. However, the molecular mechanisms by which improvements in diet and lifestyle might affect the prostate microenvironment are poorly understood. We conducted a pilot study to examine changes in prostate gene expression in a unique population of men with low-risk prostate cancer who declined immediate surgery, hormonal therapy, or radiation and participated in an intensive nutrition and lifestyle intervention while undergoing careful surveillance for tumor progression. Consistent with previous studies, significant improvements in weight, abdominal obesity, blood pressure, and lipid profile were observed (all P < 0.05), and surveillance of low-risk patients was safe. Gene expression profiles were obtained from 30 participants, pairing RNA samples from control prostate needle biopsy taken before intervention to RNA from the same patient’s 3-month postintervention biopsy. Quantitative real-time PCR was used to validate array observations for selected transcripts. Two-class paired analysis of global gene expression using significance analysis of microarrays detected 48 up-regulated and 453 down-regulated transcripts after the intervention. Pathway analysis identified significant modulation of biological processes that have critical roles in tumorigenesis, including protein metabolism and modification, intracellular protein traffic, and protein phosphorylation (all P < 0.05). Intensive nutrition and lifestyle changes may modulate gene expression in the prostate. Understanding the prostate molecular response to comprehensive lifestyle changes may strengthen efforts to develop effective prevention and treatment. Larger clinical trials are warranted to confirm the results of this pilot study.
ABSTRACT

CONTEXT: The Lifestyle Heart Trial demonstrated that intensive lifestyle changes may lead to regression of coronary atherosclerosis after 1 year.

OBJECTIVES: To determine the feasibility of patients to sustain intensive lifestyle changes for a total of 5 years and the effects of these lifestyle changes (without lipid-lowering drugs) on coronary heart disease.

DESIGN: Randomized controlled trial conducted from 1986 to 1992 using a randomized invitational design.

PATIENTS: Forty-eight patients with moderate to severe coronary heart disease were randomized to an intensive lifestyle change group or to a usual-care control group, and 35 completed the 5-year follow-up quantitative coronary arteriography.

SETTING: Two tertiary care university medical centers.

INTERVENTION: Intensive lifestyle changes (10% fat whole foods vegetarian diet, aerobic exercise, stress management training, smoking cessation, group psychosocial support) for 5 years.

MAIN OUTCOME MEASURES: Adherence to intensive lifestyle changes, changes in coronary artery percent diameter stenosis, and cardiac events.

RESULTS: Experimental group patients (20 [71%] of 28 patients completed 5-year follow-up) made and maintained comprehensive lifestyle changes for 5 years, whereas control group patients (15 [75%] of 20 patients completed 5-year follow-up) made more moderate changes. In the experimental group, the average percent diameter stenosis at baseline decreased 1.75 absolute percentage points after 1 year (a 4.5% relative improvement) and by 3.1 absolute percentage points after 5 years (a 7.9% relative improvement). In contrast, the average percent diameter stenosis in the control group increased by 2.3 percentage points after 1 year (a 5.4% relative worsening) and by 11.8 percentage points after 5 years (a 27.7%
relative worsening) \((P=.001\) between groups. Twenty-five cardiac events occurred in 28 experimental group patients vs 45 events in 20 control group patients during the 5-year follow-up (risk ratio for any event for the control group, 2.47 [95% confidence interval, 1.48-4.20]).

CONCLUSIONS: More regression of coronary atherosclerosis occurred after 5 years than after 1 year in the experimental group. In contrast, in the control group, coronary atherosclerosis continued to progress and more than twice as many cardiac events occurred.
Analysis and valuation of the health and climate change cobenefits of dietary change

Springmann M, Godfray HC, Rayner M, Scarborough P.

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**ABSTRACT**

What we eat greatly influences our personal health and the environment we all share. Recent analyses have highlighted the likely dual health and environmental benefits of reducing the fraction of animal-sourced foods in our diets. Here, we couple for the first time, to our knowledge, a region-specific global health model based on dietary and weight-related risk factors with emissions accounting and economic valuation modules to quantify the linked health and environmental consequences of dietary changes. We find that the impacts of dietary changes toward less meat and more plant-based diets vary greatly among regions. The largest absolute environmental and health benefits result from diet shifts in developing countries whereas Western high-income and middle-income countries gain most in per capita terms. Transitioning toward more plant-based diets that are in line with standard dietary guidelines could reduce global mortality by 6–10% and food-related greenhouse gas emissions by 29–70% compared with a reference scenario in 2050. We find that the monetized value of the improvements in health would be comparable with, or exceed, the value of the environmental benefits although the exact valuation method used considerably affects the estimated amounts. Overall, we estimate the economic benefits of improving diets to be 1–31 trillion US dollars, which is equivalent to 0.4–13% of global gross domestic product (GDP) in 2050. However, significant changes in the global food system would be necessary for regional diets to match the dietary patterns studied here.
Association between dietary lifestyle factors and mortality from heart disease, stroke, and type 2 diabetes in the United States
Micha R, Penalvo JL, Cudhea F, Imamura F, Rehm CD, Mozaffarian D.


**ABSTRACT**

**IMPORTANCE:** In the United States, national associations of individual dietary factors with specific cardiometabolic diseases are not well established.

**OBJECTIVE:** To estimate associations of intake of 10 specific dietary factors with mortality due to heart disease, stroke, and type 2 diabetes (cardiometabolic mortality) among US adults.

**DESIGN, SETTING, AND PARTICIPANTS:** A comparative risk assessment model incorporated data and corresponding uncertainty on population demographics and dietary habits from National Health and Nutrition Examination Surveys (1999-2002: n = 8104; 2009-2012: n = 8516); estimated associations of diet and disease from meta-analyses of prospective studies and clinical trials with validity analyses to assess potential bias; and estimated disease-specific national mortality from the National Center for Health Statistics.

**EXPOSURES:** Consumption of 10 foods/nutrients associated with cardiometabolic diseases: fruits, vegetables, nuts/seeds, whole grains, unprocessed red meats, processed meats, sugar-sweetened beverages (SSBs), polyunsaturated fats, seafood omega-3 fats, and sodium.

**MAIN OUTCOMES AND MEASURES:** Estimated absolute and percentage mortality due to heart disease, stroke, and type 2 diabetes in 2012. Disease-specific and demographic-specific (age, sex, race, and education) mortality and trends between 2002 and 2012 were also evaluated.
RESULTS: In 2012, 702,308 cardiometabolic deaths occurred in US adults, including 506,100 from heart disease (371,266 coronary heart disease, 35,019 hypertensive heart disease, and 99,815 other cardiovascular disease), 128,294 from stroke (16,125 ischemic, 32,591 hemorrhagic, and 79,578 other), and 67,914 from type 2 diabetes. Of these, an estimated 318,656 (95% uncertainty interval [UI], 306,064-329,755; 45.4%) cardiometabolic deaths per year were associated with suboptimal intakes-48.6% (95% UI, 46.2%-50.9%) of cardiometabolic deaths in men and 41.8% (95% UI, 39.3%-44.2%) in women; 64.2% (95% UI, 60.6%-67.9%) at younger ages (25-34 years) and 35.7% (95% UI, 33.1%-38.1%) at older ages (≥75 years); 53.1% (95% UI, 51.6%-54.8%) among blacks, 50.0% (95% UI, 48.2%-51.8%) among Hispanics, and 42.8% (95% UI, 40.9%-44.5%) among whites; and 46.8% (95% UI, 44.9%-48.7%) among lower-, 45.7% (95% UI, 44.2%-47.4%) among medium-, and 39.1% (95% UI, 37.2%-41.2%) among higher-educated individuals. The largest numbers of estimated diet-related cardiometabolic deaths were related to high sodium (66,508 deaths in 2012; 9.5% of all cardiometabolic deaths), low nuts/seeds (59,374; 8.5%), high processed meats (57,766; 8.2%), low seafood omega-3 fats (54,626; 7.8%), low vegetables (53,410; 7.6%), low fruits (52,547; 7.5%), and high SSBs (51,694; 7.4%). Between 2002 and 2012, population-adjusted US cardiometabolic deaths per year decreased by 26.5%. The greatest decline was associated with insufficient polyunsaturated fats (-20.8% relative change [95% UI, -18.5% to -22.8%]), nuts/seeds (-18.0% [95% UI, -14.6% to -21.0%]), and excess SSBs (-14.5% [95% UI, -12.0% to -16.9%]). The greatest increase was associated with unprocessed red meats (+14.4% [95% UI, 9.1%-19.5%]).

CONCLUSIONS AND RELEVANCE: Dietary factors were estimated to be associated with a substantial proportion of deaths from heart disease, stroke, and type 2 diabetes. These results should help identify priorities, guide public health planning, and inform strategies to alter dietary habits and improve health.
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