Diet and Mortality

What We Know

› Diet and other lifestyle factors such as physical activity, alcohol use, and cigarette smoking are substantial determinants of early mortality. The effect of diet is profound, especially on such conditions as cardiovascular disease (CVD), diabetes mellitus, type 2 (DM2), hypertension, hyperlipidemia, asthma, obesity, and cancer. Researchers estimate that 300,000–800,000 deaths in the United States could be prevented each year if evidence-based dietary recommendations such as those of the American Heart Association (AHA) were followed\(^{14,18,24,28}\)

- Over 60% of adults (≥ 20 years of age) in the U.S. are overweight or obese, making overweight and obesity the predominant nutritional disorder in the U.S.\(^{14,28}\)

–CVD, including coronary artery disease (CAD) and stroke, is the leading cause of death worldwide, accounting for 17.3 million deaths per year\(^{(1)}\)

- Obesity is a significant risk factor for hypertension, which dramatically increases the risk of developing CVD. Left untreated, hypertension can lead to myocardial infarction, heart failure, stroke, or kidney failure. It is estimated that 1 billion persons worldwide, including 67 million Americans, meet the criteria for a diagnosis of hypertension\(^{(25)}\)

- Hypertension is currently defined in the U.S. as a systolic blood pressure (BP) of 140 mm Hg or greater and/or a diastolic BP of 90 mm Hg or greater that is sustained in three or more separate readings

- Obesity is a significant risk factor for DM2, which significantly accelerates the development of atherosclerosis, a contributing factor in the development of nephropathy, retinopathy, CVD, and cerebrovascular and peripheral vascular diseases\(^{(1)}\)

- Metabolic syndrome (MetS), characterized by a cluster of CVD risk factors that include abdominal obesity, hypertension, poor lipid profile (e.g., high triglycerides, low high-density lipoprotein [HDL] cholesterol), and insulin resistance, is predictive of heart attack, stroke, DM2, and all-cause mortality\(^{(26,37)}\)

–In the United States, cancer is the second leading cause of mortality. It is estimated that diet contributes to 35% of all cases of human cancer. Each year, approximately 100,000 new cases of cancer are identified as being associated with excess body fat, and approximately 280,000 persons in the U.S. die as a result of complications related to excess weight\(^{(1,14)}\)

- Overweight and obesity are clearly linked to increased risk of breast cancer (in postmenopausal women), colorectal cancer, endometrial cancer, esophageal cancer, kidney cancer, and pancreatic cancer\(^{(1)}\)

› Research indicates that diet plays an important role in the prevention of or contribution to conditions that lead to early mortality. Consuming a diet high in fiber and rich in fruits and vegetables is shown to improve blood lipid profiles and reduce the risk of hypertension, DM2, CVD, CAD, cancer, and all-cause mortality while diets that are high in cholesterol and saturated fat are definitively linked to obesity, CVD, and cancer.\(^{(2,21,24,34)}\) The International Agency for Research on Cancer, the cancer agency...
of the World Health Organization (WHO), recently declared that processed meat is a carcinogen and that red meat is probably carcinogenic (5,21).

• The Mediterranean diet replaces saturated fats with unsaturated fats (predominantly olive oil) and includes eating a variety of fresh fruits and vegetables, foods that are seasonally fresh, and foods that are locally grown. Following the Mediterranean diet is associated with a greater than 50% lower risk of obesity (8,10,17,30).

  – Persons who follow the Mediterranean diet have lower risk for heart disease, lower risk for sudden death from myocardial infarction (MI), reduced cancer risk, and lower rates of all-cause mortality. Other potential benefits of following the Mediterranean diet include weight loss, reduced pain and swelling in the presence of rheumatoid arthritis and other inflammatory diseases, and lower risk of developing MetS and Alzheimer’s disease (AD).

• The DASH (Dietary Approaches to Stop Hypertension) diet is effective in reducing BP. Following the DASH diet involves choosing foods that are high in fiber, moderate in fat and protein, and low in saturated fat, cholesterol, and sodium. Eating fruits and vegetables is encouraged along with regular consumption of whole grains, legumes, nuts and seeds, low-fat dairy products, and lean meats (4,16,17,30,36).

  – While the DASH diet is known for its effectiveness in the treatment of hypertension, adherence to the DASH diet is also associated with reduced incidence of heart disease, stroke, colorectal cancer (CRC), DM2, and all-cause mortality (4,23,31,32,33).

• The AHA has established dietary and lifestyle guidelines for reducing risk of CVD and CAD. The AHA dietary and lifestyle recommendations include the following (2,17,30):

  – Balance calorie intake and physical activity to achieve or maintain a healthy body weight
  - Calculate the patient’s body mass index (BMI) by dividing body weight (kilograms) by height (meters squared); or by multiplying 703 by weight (pounds) and dividing by height (inches squared) (24).
    - Underweight: < 18.5; normal: 18.5–24.9; overweight: 25–29.9; obese: > 30
  - In patients over 65 years of age, evidence suggests that a slightly higher BMI (25–27) may help prevent bone deterioration and is associated with a lower risk of mortality
  - In some cases, body composition testing (e.g., dual-energy x-ray absorptiometry [DXA] scan, skin calipers) may be necessary
  - Education is recommended to increase awareness and understanding of information contained in food labels, calorie content of food items, and appropriate portion control (24).

  – Physical activity of at least 150 minutes each week, including strength training at least 2 days each week, is recommended (2).

  – Consume a diet that is rich in vegetables and fruits (2,24).
    - Eat a variety of deeply colored fruits and vegetables (e.g., spinach, carrots, berries)
    - Consumption of fruit juice is not recommended because juice does not provide as much fiber as eating whole fruit and has a higher calorie content per serving
  - Choose whole grain foods that are high in fiber (2,24).
    - At least half of all grains consumed should be whole grains
  - Consume fish, especially oily fish, at least twice a week (2,3,24,29).
    - Fish is a good source of omega-3, an unsaturated fat that has many health benefits, including reduced risk for CVD and CAD
  - Limit intake of saturated fat, trans fat, and cholesterol (2,24).
    - It is currently recommended that dietary fat and cholesterol intake should be limited as follows:
      - Total dietary fat < 35% of total caloric intake but not < 20%
      - Saturated fat < 7% of total caloric intake
      - Trans fat < 1% of total caloric intake
      - Cholesterol < 300 mg/day
  - Choose lean meats
  - Choose dairy products that are fat-free (skim), 1% fat, and low-fat
  - Limit consumption of partially hydrogenated fats
  - Minimize intake of beverages and foods that contain added sugar (2,24).
  - Choose and prepare foods with little or no salt (2,24).
- Sodium intake should not exceed 2,300 mg/day
  - Persons who consume alcohol should do so in moderation\(^{(2)}\)
- It is recommended that men limit alcohol intake to 2 drinks/day and women limit intake to 1 drink/day, preferably consumed with meals
  - One drink is defined as 12 oz of beer, 4 oz of wine, or 1½ oz of 80-proof liquor

Additional research findings related to diet and mortality

- Researchers evaluated dietary trends in relation to disease burden in the U.S. from 1999-2012 and reported that the improvements of dietary quality (e.g., increased consumption of fruits, whole grains, nuts, legumes, and PUFAs; decreased intake of sugar-sweetened beverages and red and processed meat) during that time resulted in the prevention of 1.1 million premature deaths, 8.6% fewer cases of CVD, 1.3% fewer cases of cancer, and 12.6% fewer DM2 cases. Researchers concluded that the improvement in dietary quality significantly reduced the disease burden; however, overall dietary quality remains poor within the U.S. With policy initiatives designed to promote further improvements in dietary quality, a profound reduction in diet-related morbidity and mortality could be accomplished\(^{(38)}\)

- Data from a population-based prospective Norwegian cohort study of 10,000 men followed from 1968 through 2008 was used to investigate the association between diet and all-cause mortality as well as cause-specific mortality. Researchers concluded that higher consumption of vegetables and fruits (particularly berries) was significantly associated with a delayed risk of all-cause mortality as well as mortality from cancer and stroke\(^{(19)}\)

- Red meats and saturated fats are linked to increased risk for CAD, CVD, and cancer. Authors of a population study conducted in Australia estimated that a 10% reduction in low-density lipoprotein (LDL) cholesterol intake could potentially save 3,000 Australian lives each year related to heart attack and stroke\(^{(20)}\)

- Results of a study that evaluated the impact of long-chain omega-3 fatty acids from diet and supplements on cause-specific and all-cause mortality revealed that consumption of omega-3 fatty acids is associated with a significantly reduced risk of all-cause mortality and mortality from cancer and a small reduction in risk of death from CVD\(^{(25)}\)

- Emerging evidence suggests that vitamin D insufficiency/deficiency is associated with increased risk for all-cause mortality, CVD, certain cancers (e.g., colorectal, prostate, ovarian, and breast), and DM2\(^{(2)}\)

- Authors of a meta-analysis of 20 cohort studies reported that there was a significant inverse relationship between coffee consumption and total mortality.\(^{(22)}\) Similar findings were found by other researchers who reported that habitual coffee consumption is associated with a reduced risk of total mortality as well as mortality from heart disease, CVD, and respiratory disease\(^{(6,13,15)}\)

- Food manufacturers often hydrogenate unsaturated fats (i.e., add hydrogen to the fat compound) to make them more manageable and more shelf-stable (typically in liquid form), a process that results in the creation of trans fats, which increase blood LDL cholesterol, lower blood HDL cholesterol, and increase blood clotting, all of which increase risk for heart disease, heart attack, and stroke. High intake of trans fats is associated with a higher likelihood of developing DM2, dementia, gallstones, infertility, and certain cancers (e.g., colon cancer, breast cancer)\(^{(12,27)}\)

  – WHO has recommended eliminating trans fat from the global food supply. Denmark banned partially hydrogenated oils in 2003, followed by several other countries. In 2006, New York City passed a similar ban against partially hydrogenated oils used in restaurant foods with good compliance, followed by Philadelphia, Chicago, and the state of California in 2008. The U.S. Food and Drug Administration (FDA) issued a regulation requiring food manufacturers to list trans fat on the Nutrition Facts label, which became mandatory in 2008. The FDA has also proposed that partially hydrogenated oils be declared unsafe, regulating the elimination of all but a small amount of trans fats from foods sold in the U.S. The Centers for Disease Control and Prevention (CDC) estimates that the FDA’s proposed regulation could prevent 20,000 coronary events and 7,000 coronary-related deaths in the U.S. each year\(^{(7,35)}\)

What We Can Do

- Become knowledgeable about the relationship between diet and mortality so you can accurately assess your patients’ personal characteristics and health education needs; share this information with your colleagues
- Assess your patients’ health and diet history and their risk factors for obesity, hypertension, DM2, CAD, CVD, and cancer
- Educate your patients regarding the importance of participating in regular exercise and eating a balanced diet that includes appropriate dietary intake of fat, lean proteins, complex carbohydrates, and a variety of fruits and vegetables. Educate patients on the nutritional implications of relevant conditions (e.g., hypertension, obesity, DM2, CAD, CVD, cancer) and the rationale for diet therapy; supplement verbal education with written information, if available
• As tolerated, eat a calorie-appropriate diet that includes fish and other lean proteins, unsaturated fats (including omega-3), complex carbohydrates (e.g., whole unrefined grains), legumes, nuts and seeds, and a variety of fruits and vegetables. (For more information on eating a balanced diet, see the United States Department of Agriculture [USDA] food guidance system, MyPlate, at https://www.choosemyplate.gov/)

  – Consume foods containing a variety of at least 5 fruits and vegetables a day in order to supply ample vitamins, minerals, phytonutrients (i.e., beneficial plant-derived nutrients), and fiber. Eating a variety of deeply colored fruits and vegetables (e.g., spinach, carrots, berries) should be emphasized

  – Eat 25–30 g of fiber/day (food sources: oat bran, barley, nuts, seeds, beans, lentils, peas, and fruits and vegetables). At least half of all grains consumed should be whole grains

  – Consume fish, especially oily fish, at least twice a week. Fish is a great source of omega-3, an unsaturated fat that has many health benefits, including reduced risk for CVD. (Note: Plant sources of omega-3 include soybean, walnuts, canola, and flaxseed; however plant sources do not contain eicosapentaenoic acid [EPA] or docosahexaenoic acid [DHA], two forms of omega-3 that are largely credited for the health benefits associated with omega-3 intake)

  – Ingest adequate calcium (at least 1,200 mg/day) to reduce risk for osteoporosis and CVD; good calcium sources are dairy products, fish with bones, broccoli, and legumes

  – Reduce risk for CVD, cancer, DM2, and stroke by choosing unsaturated fats (including omega-3 fatty acid) and by limiting total fat intake to 30% or less of daily calories, limiting saturated fat (found in meat, whole milk, cream, butter, and cheese) to less than 10% of daily calories, and consuming less than 200 mg of cholesterol per day

• Emphasize importance of portion size

• Take supplemental vitamins as prescribed

• Participate in regular moderate physical activity of at least 150 minutes each week, including strength training at least 2 days each week, if medically appropriate

• Recruit the help of family and friends to assist in meal planning, grocery shopping, and food preparation

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**Coding Matrix**

*References are rated using the following codes, listed in order of strength:*

- **M** Published meta-analysis
- **SR** Published systematic or integrative literature review
- **RCT** Published research (randomized controlled trial)
- **R** Published research (not randomized controlled trial)
- **C** Case histories, case studies
- **G** Published guidelines
- **RV** Published review of the literature
- **QI** Published quality improvement report
- **L** Legislation
- **PGR** Published government report
- **PFR** Published funded report
- **PP** Policies, procedures, protocols
- **X** Practice exemplars, stories, opinions
- **GI** General or background information/texts/reports
- **U** Unpublished research, reviews, poster presentations or other such materials
- **CP** Conference proceedings, abstracts, presentation

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**References**


