

Evidence-Based Evaluation of Popular Weight Loss Diets

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According to the Centers for Disease Control, one out of two adult Americans exceeds the upper healthy weight limit (body mass index or BMI ≥ 25). Moreover, 20% of US adults are clinically obese (BMI ≥ 30). Health problems associated with our country's obesity epidemic are well established: type 2 diabetes, cardiovascular disease, stroke, gallbladder disease, osteoarthritis, sleep apnea and possibly cancer. The 61% increase in the incidence of US adult obesity from 1991 to 2000 has coincided with a 49% rise in type 2 diabetes among adult Americans.

The proliferation of top-selling diet books published in the past five years is an ironic twist to the health concerns among overweight Americans striving to lose weight. These popular diets typically offer dieters "empty" promises such as quick weight loss, increased energy level and absence of hunger/food deprivation. But few dieters actually try to improve their eating habits. The Centers for Disease Control report that only 17.5% of dieters try to consume fewer calories and increase physical activity, two key factors for weight control. Furthermore, approximately one out of four dieters consumes the recommended five servings of fruits and vegetables daily. Considering that dieters fail to practice sound weight loss practices, approximately 70% of these individuals regain at least half of their weight loss within two years.

Despite the apparent poor success rate of fad diets, these reducing eating plans continue to grow in popularity among overweight Americans wishing to shed some pounds. In fact, over half of the 50 best-selling diet books have been published since 1999.

What is the "magic" bullet for successful weight loss? Researchers from the United States Department of Agriculture (USDA) and other institutions have conducted an extensive review of scientific literature to evaluate the efficacy of popular diets. Based on their analysis of existing data collected on reducing diets, **calorie restriction in itself is the "key" ingredient for successful weight loss.** Unfortunately, evidence for the long-term health safety and maintenance of weight loss associated with fad diets remains unclear. Highlights of research findings on popular diets are described below.

1. CALORIES: *Eating less calories leads to weight loss.*
 - **Total daily caloric intake averaging 1400-1500 calories daily results in weight loss** regardless of the macronutrient composition (i.e. breakdown of protein, carbohydrate and fat) of the weight-reducing diet. Although physical activity can enhance weight loss, dieters who adhered to a 1500 calorie/day diet still lost weight because they expended more energy than that consumed.
 - **Dieters who adhered to a low-fat, high carbohydrate diet rich in fruits, vegetables and grains consumed less calories than those on other types of diets** (see table below). In short, weight loss study results indicate an inverse relationship between carbohydrate intake and body weight; heavier people consistently consume less carbohydrate. These findings dispel the myth among dieters that carbohydrates are "fattening".
 - **Moderate-fat weight loss diets also result in loss of body weight and body fat even when food is consumed *ad libitum*.** For example, the mean caloric intake of individuals following a **general diet** using the USDA Food Guide Pyramid guidelines (diet composition: 55% carbohydrate, 25% fat, 20% protein) was approximately 1895 calories daily compared to 2166 calories/day for those consuming a high-fat, low-carbohydrate dietary regimen. Furthermore, those who regularly adopted a **high-carbohydrate, moderate fat diet** had a lower body mass index (BMI) than individuals consuming higher fat diets. These findings suggests that individuals who consistently opt for foods containing mostly carbohydrate and some protein (*1 gram of protein or carbohydrate = 4 calories*) are consuming less calories over time compared to those who eat more energy-dense fatty foods (*1 gram fat = 9 calories*).

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2. Nutrition Adequacy

- High-fat, low-carbohydrate diets are deficient in several nutrients. These regimens are consistently low in vitamins A, B₆, D and E, thiamin, folate, calcium, magnesium, iron, potassium and dietary fiber. Hence, supplementation is highly recommended for those who adhere to this type of weight-reducing regimen.
- Moderate-fat, low-carbohydrate diets are nutritionally balanced per the USDA Food Guide Pyramid guidelines. If one or more of the six food groups (i.e. grains, fruits, vegetables, meats, dairy and fats & sugars) is eliminated or severely restricted, inadequate intake of nutrients provided from that food category is likely to occur.
- Low-fat, high-carbohydrate diets are often deficient in vitamin E, vitamin B₁₂ and zinc. Eating foods fortified with these nutrients or a supplementation may be necessary for those adhering to low-and very-low fat regimens.
- Table below summarizes the nutrient differences of popular diets.

Approximate Macronutrient Breakdown of Popular Diet Plans*

Type of Diet	Total Calories	Fat grams (% calories)	Carbohydrate grams (% calories)	Protein grams (% calories)	Nutrition Adequacy
Typical American Diet	2200	85 (35%)	275 (50%)	82.5 (15%)	
<p>High Fat, Low-Carbohydrate Diet</p> <ul style="list-style-type: none"> • Dr. Atkins Diet • Zone Diet • Sugar Busters • Protein Power 	1414	96 (60%) Fat Level Range: 35-65%	35 (10%)	105 (30%)	Low in several nutrients: Vitamins A, B ₆ , D, E, thiamin, folate, calcium, magnesium, iron, zinc, potassium, and dietary fiber. This type of diet also contains high amounts of total fat, saturated fat, and cholesterol. Nutritional supplementation is highly recommended.
<p>Moderate Fat Diet</p> <ul style="list-style-type: none"> • USDA Food Guide Pyramid • DASH Diet • American Diabetic Association • Weight Watchers • Jenny Craig 	1450	40 (25%) Fat Level Range: 21-34%	218 (60%)	54 (15%)	Usually a nutritionally balanced diet, assuming the dieter eats a variety of foods from all food categories. However, if certain food categories are eliminated, deficiencies in certain nutrients especially calcium and zinc.
<p>Low- and Very Low-Fat Diet</p> <ul style="list-style-type: none"> • Volumetrics • Dean Ornish's <i>Eat More, Weigh Less</i> • New Pritikin Program 	1450	20 (13%) Fat Level varies: 10-20%	235-271 (70%)	54-72 (17%)	Deficient in zinc and vitamin B ₁₂ due to infrequent meat consumption. This type of diet can be inadequate in certain nutrients found in oils, nuts and seeds.

*Source: Adapted from: Freedman, M., King, J. and Kennedy, E. Popular Diets: A Scientific Review. *J of Obesity Research*. 2001: Suppl 1.

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3. Relationship between Weight-Reducing Diet and Body Composition

- Weight loss in itself results in loss in body weight, body fat and even lean muscle mass. Total daily calorie restriction (~1500 calories/day) sustained over a period of time promotes a loss of body fat, despite the macronutrient composition of the diet.
- Physical activity is strongly recommended for weight management because it facilitates loss of body fat by increasing (1) energy expenditure, (2) lean muscle mass and (3) metabolism.

4. Physiological Changes During Weight Loss

- Weight loss is directly correlated with a decrease in (1) total blood cholesterol, (2) LDL-cholesterol and (3) plasma triglycerides. Greater reduction in LDL-cholesterol is observed during weight loss with a low saturated fat intake. The types of dietary fat consumed and duration of the weight loss program affected HDL-cholesterol levels.
- Caloric restriction regardless of the macronutrient content of the weight loss diet improves glycemic control by lowering blood sugar and insulin levels.
- Weight loss in itself decreases blood pressure. However, in the **absence** of weight loss, the DASH diet (a low-fat diet rich in fruits, vegetables, whole grains and low-fat dairy foods) promotes a reduction in blood pressure. This effect is magnified when the DASH diet is combined with a low sodium intake.

5. Hunger, Satiety and Adherence to Weight Loss Diets

- Insulin and leptin regulate long-term weight regulation. Insulin stimulates the uptake of glucose and proteins into the cells as well as possibly increasing appetite. Leptin, on the other hand, is a hormone released from fat cells, which helps suppress appetite and increase metabolism. Insulin and leptin secretion is influenced by the macronutrient composition of the diet although the actual mechanisms remain unclear. During weight loss, blood insulin and leptin levels drop accordingly.
- All fat-restricted diets offer satiety value, contrary to claims made by high-protein and high fat diet gurus. In fact, dieters who follow both a calorie and fat-restricted regimen commonly complain of having “too much food to eat”. This may be due to the high fiber, high water content of low-fat foods, which may account for dieters’ enhanced feeling of fullness during and between meals. Additionally, those who adhere to a low-fat regimen over time appear to develop an aversion to fatty foods, which may also contribute to long-term success in weight control. Furthermore, high dietary fiber intake is correlated with lower insulin levels and long-term maintenance of weight loss.
- Neurochemical factors, gastric signals, emotional factors, individual taste preferences are other contributing factors which can account for individual differences in appetite, food intake and body weight.

6. Food Guide Pyramid Comparison of Weight Reducing Regimens

- Diet quality (total fat, saturated fat, cholesterol, sodium and menu variety) for high-carbohydrate, low- to moderate-fat diets scored significantly higher compared to that of high-fat, low-carbohydrate regimens. Moreover, **vegetarian** high-carbohydrate diets provided the greatest nutritional value.

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- Percent of energy from carbohydrate indirectly correlates with intake of fat, protein, dietary cholesterol and calories. The carbohydrate content of selected diets reviewed also revealed an indirect relationship with body mass index. In short, traditional high carbohydrate diets (>55% total calories) generally provide less fat and calories, more nutrients and greater menu variety compared to popular high-fat, low-carbohydrate diets.
- Sample menu illustrating a nutritionally balanced, high-carbohydrate, low-fat reducing diet fits into the framework of the USDA Food Guide Pyramid is shown below.

USDA Food Guide Pyramid Adapted for Weight Reduction: Nutrition Analysis*			
Breakfast	Lunch	Dinner	
6 oz orange juice (1 fruit) 1 cup wheat flakes cereal (1 grain) 1 cup nonfat milk (1 dairy) ½ banana (1 fruit)	Turkey Sandwich: 2 oz fat-free turkey breast (1 meat) 1 reduced-fat cheese (1/2 dairy) 2 leafs Romaine lettuce 2 slices tomato 1 tablespoon dijon mustard 2 slices whole wheat bread (2 grains) 12 baby carrots (2 vegetable) 1 ounce baked tortilla chips (1 grain) 1 cup unsweetened ice tea	3 ounces grilled white fish (1 meat) 1 cup steamed brown rice (2 grain) 1 cup grilled mixed fresh vegetables (2 vegetable) seasoned with ½ tablespoon of olive oil (1-1/2 fats) Salad: 2 cups Romaine lettuce (2 vegetables) 5 cherry tomatoes; 4 slices cucumber (1 vegetable) 2 tablespoons reduced fat dressing (2 fats) Beverage: Herbal Tea Dessert: 1 cup fat-free frozen yogurt (1/2 dairy)	
Nutrition Analysis:	Nutrition Adequacy	Food Guide Pyramid Comparison	
Total calories: 1592	Meets or exceeds the Daily Reference Intake (DRI) for 16 vitamins and minerals based on a reference premenopausal female (targeted group that typically "tries" several weight loss diets).	Sample Menu:	
Protein: 77 g (19% calories)		Food Guide Pyramid:	
Carbohydrate: 252 g (63% calories)		6 Grains	6-11 Grains
Fat: 37 g (21 % calories)		5 Vegetables	3-5
Saturated Fat: 7 g (4 % calories)		Vegetables	
Cholesterol: 105 mg		2 Fruits	2-4 Fruits
Dietary Fiber: 29 g		2 Meats/Proteins	2-3 Meats
Sodium: 3024 mg		2 Dairy	2-3 Dairy
Potassium: 3875 mg		3-1/2 Fats	Sparingly
		*Nutrient Data System 2.93 software used for analysis of sample menu	

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