The Good Carbohydrate

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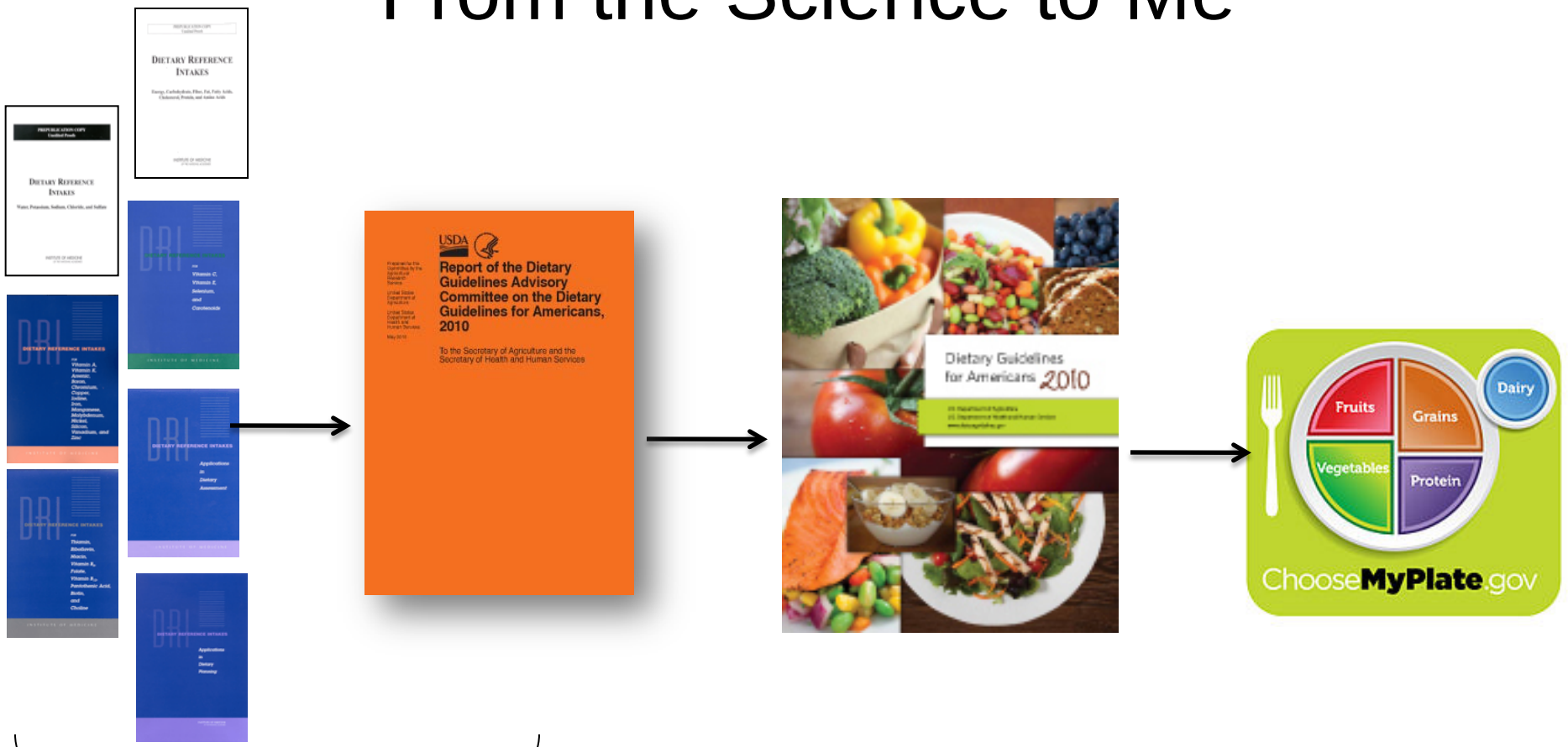
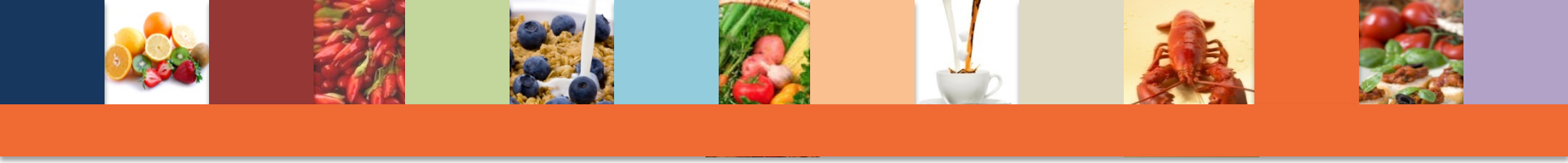
From the Science to Me

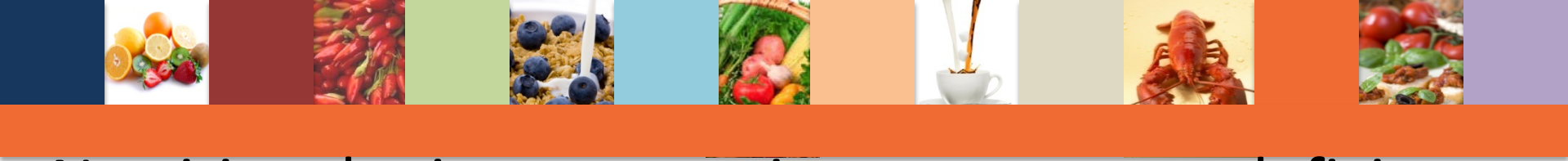


The Science **Policy** **Me**



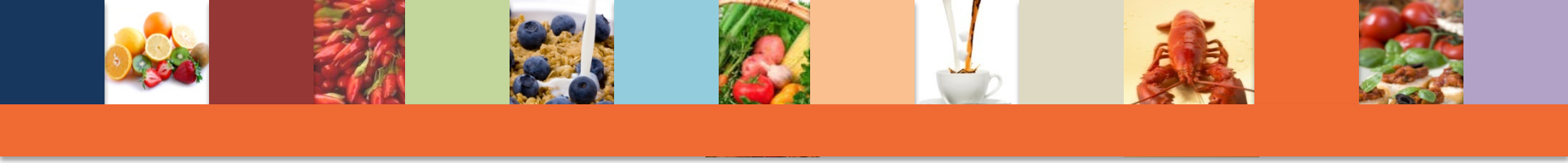
There is no perfect diet!

- Humans are omnivores, like pigs, and are adaptable to a wide range of foods
- Humans have survived and prospered on all kinds of diets, mostly reflecting access to food supply
  - Traditional Arctic diet: 80% of kcals from fat
  - Traditional African diet: 80% of kcals from carbohydrate
- Because of concerns with fat and cardiovascular disease, US diet has moved from higher fat (42% of kcal) to lower fat (30% of kcal) – but more calories



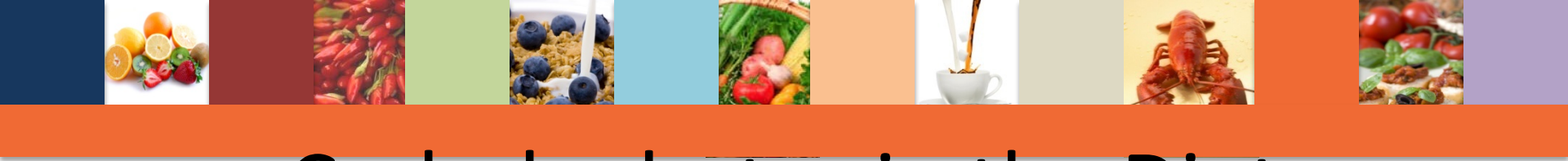
Nutritional science – nutrients to prevent deficiency diseases

- 1941:
  - National Academy of sciences began issuing “Recommended Dietary Allowances” – quantity of nutrients a person needed to consume daily to ensure basic good health, proper growth and reproductive success, and to prevent nutrient deficiency diseases
  - Nutritional deficiency diseases have been virtually eliminated in the US, thanks to enrichment of refined grains and other fortification strategies



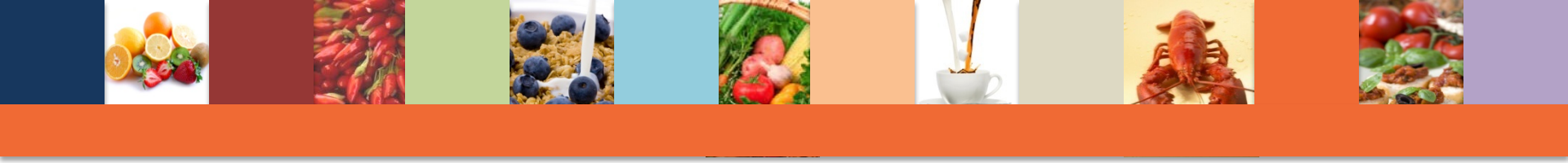
Nutrient Adequacy

- Meet nutrient needs without exceeding calorie needs
- Dietary Reference Intakes (DRIs)
  - Acceptable Macronutrient Distribution Ranges (AMDR)
    - Protein – 10-35% of kcal
    - Carbohydrates – 45 – 65% of kcal
    - Fat – 20 – 35% of kcal
  - Recommended Dietary Allowance (RDA)
  - Adequate Intake (AI)
  - Tolerable Upper Level Intake (UL)



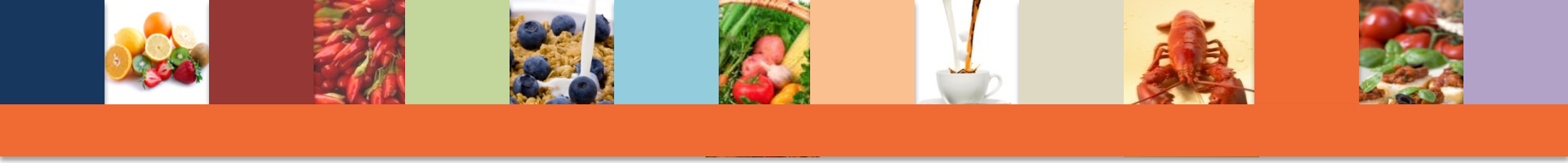
Carbohydrates in the Diet

- Vegetables, fruits, grains, legumes, and milk are main food sources of carbohydrates
- Grains and certain vegetables (potatoes, corn) high in starch (glucose) – except sweet potatoes (sucrose)
- Fruits and green vegetables contain little starch – fruits mostly sugar
  - Apples and pears high in fructose (66%), most other fruits 50/50 glucose/fructose (sucrose); milk 50/50 glucose/galactose
- Sugar can be isolated from sugar beets, sugar cane or manufactured from starch (corn sugar)



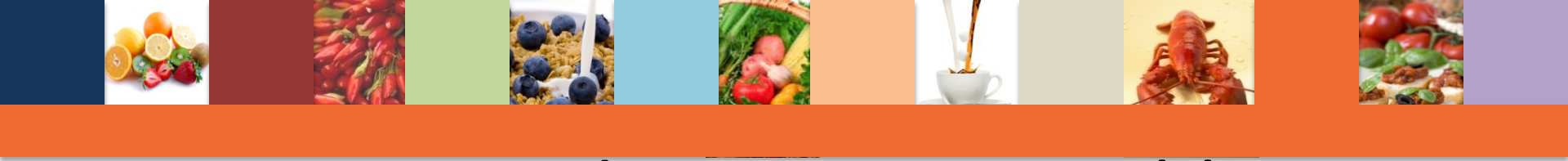
Differences in Carbohydrates

- Chemical structure – mono, di, polysaccharide
  - Mono: few in food supply; fructose in apples and pears
  - Di: sucrose (glucose, fructose) and lactose (glucose, galactose)
  - Poly: starch
- Digestible vs. non-digestible
- Speed of digestion and absorption – Glycemic index
- Physical structure – in solution, part of a food, associated substances (protein), part of a seed or grain, particle size



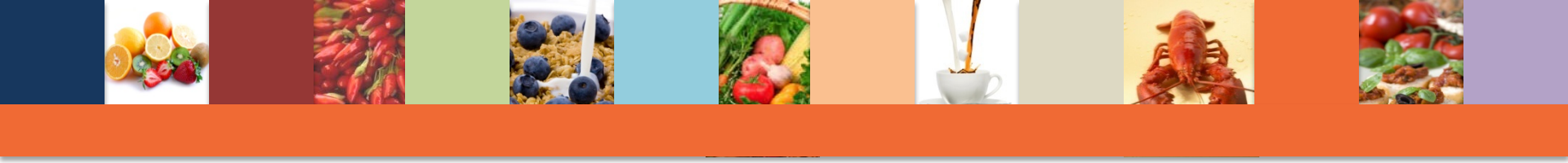
Of what use are carbohydrates?

- Sweeteners
- Food preservation
- Functional attributes (viscosity, texture, body, browning capacity)
- Energy
- Fermentable substrates – dietary fiber



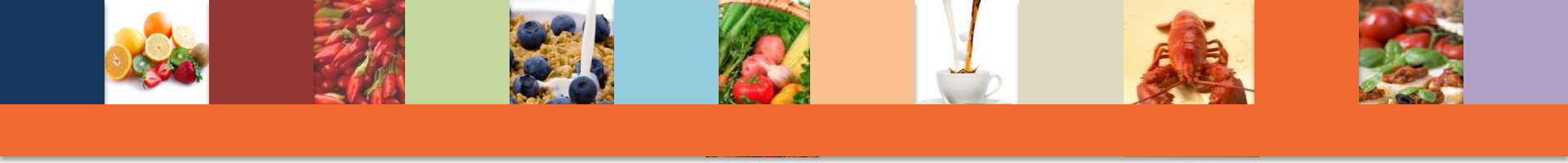
Dietary Guidance on Digestible CHOs

- RDA of 130 grams of carbohydrate per day
- 45%–65% of calories should come from carbohydrate (AMDR) – no UL
- Carbohydrates are the fill after protein needs are met – high-calorie diets should be high in carbohydrate (sports nutrition)
- Added sugar – 25% or less of calories – based on nutrient dilution, not any link to negative health status



Intrinsic vs. Extrinsic sugars

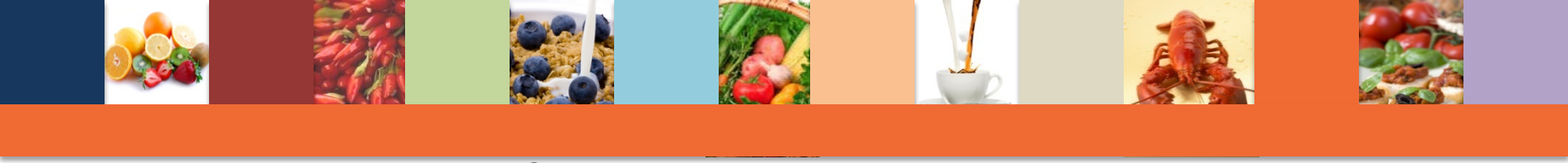
- Intrinsic sugar – sugars that are naturally occurring within a food
- Extrinsic sugars – those added to food AKA “added sugar”
- No difference in the molecular structure of sugar molecules, whether they are naturally occurring in the food or added to the food
- No analytical method to differentiate between added sugar and intrinsic sugar



US Carbohydrate Label

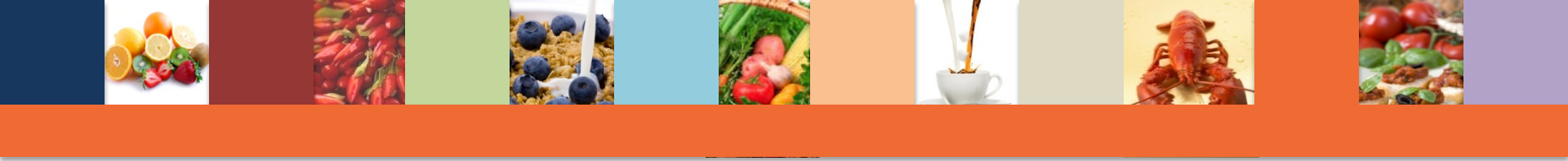
Total carbohydrate – measured by difference

- Lists sugar – total – although movement to list added sugar
- List dietary fiber – soluble and insoluble
- No information on glycemic index, resistant starch, sugar alcohols, whole grain – unless provided by manufacturer



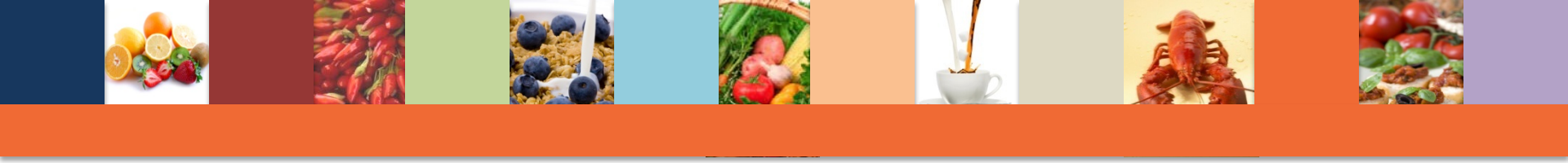
Fiber Agreement

- Marker of a healthy diet
  - whole grains, fruits, vegetables, legumes
- Concept
  - carbohydrates and lignin that escape digestion in the upper GI tract but may be fermented in the gut
- Nutrient
  - according to 2002 Dietary Reference Intakes (DRIs)
- Regulated
  - On the Nutrition Facts panel – 25 g Daily Value (DV)
- Health claims
  - oat bran, barley bran, and psyllium and CVD in US



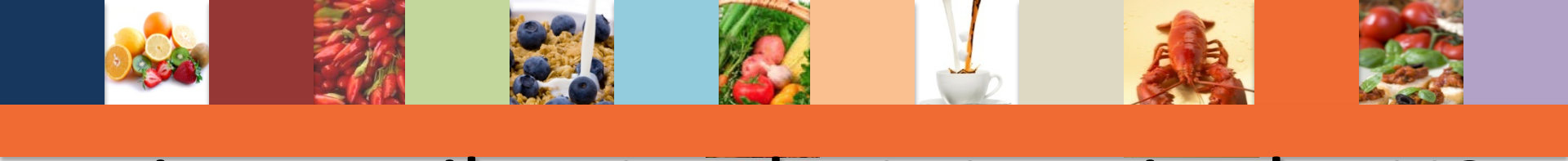
Dietary Fiber (Institute of Medicine, 2001)

- Dietary fiber – carbohydrates and lignin that are intrinsic and intact in plants
  - Found in grains, vegetables, legumes, fruit
  - Accepted physiological effects include laxation, attenuation of blood glucose, normalization of serum cholesterol
  - Measured by challenging chemical methods



Functional Fiber (Institute of Medicine, 2001)

- Functional fiber – isolated or purified carbohydrates not digested and absorbed that confer beneficial physiological effects
  - Laxation (wheat bran, psyllium)
  - Normalization of blood lipid levels (oat bran, barley bran, psyllium)
  - Attenuation of blood glucose (guar gum, psyllium)
  - Other effects
    - Weight management – satiety, lower fat absorption, weight loss
    - Blood pressure control
    - Gut environment – microflora, fermentation, transit time



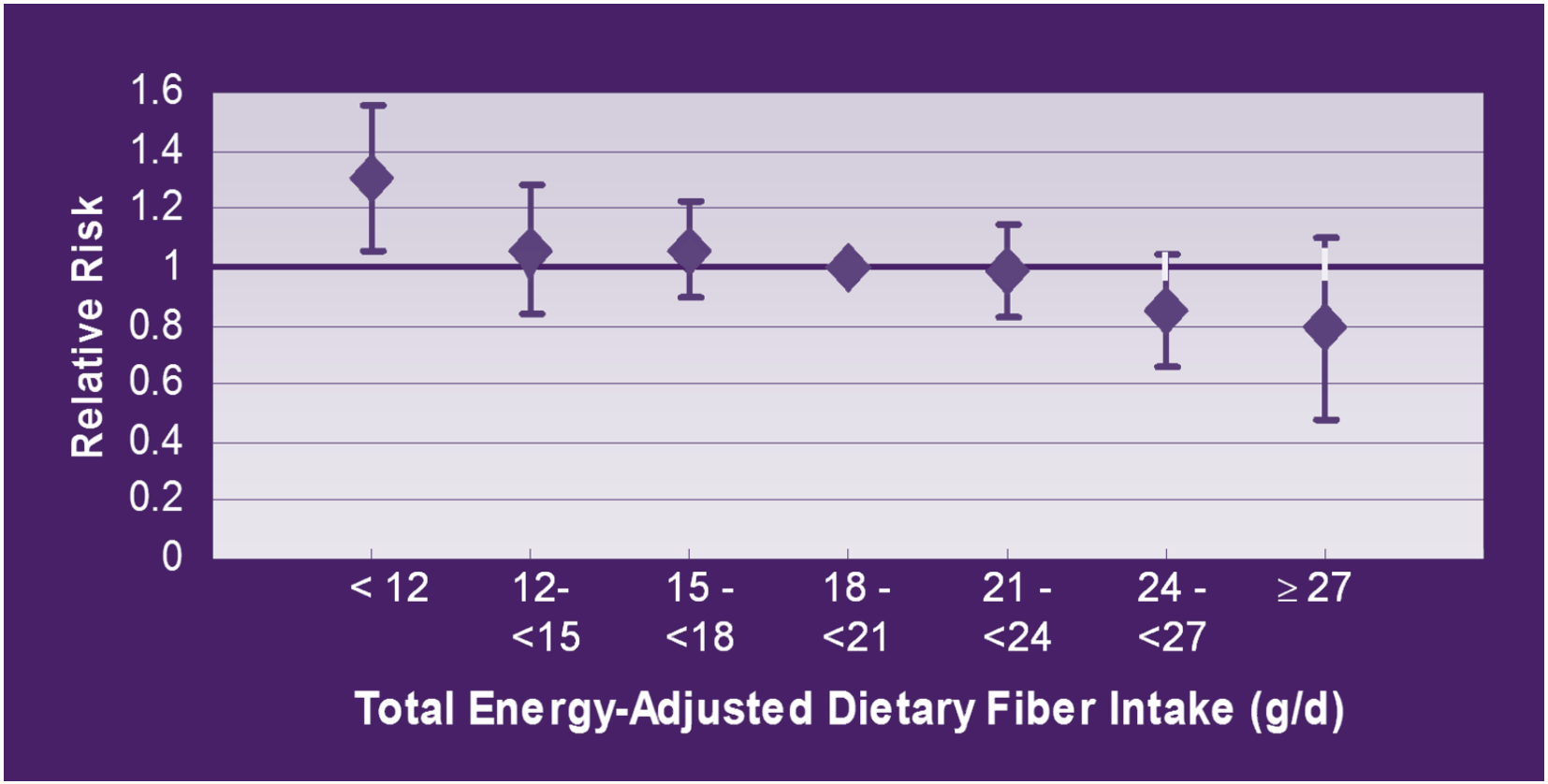
Dietary Fiber Intake Is Low in the US

- Usual intake only 15 g/day – recommended intakes 25 – 38 g/day – 14 g/1000 kcals
- Most fiber-containing foods: 1 – 3 g
  - Apple – 3 grams
  - Lettuce – 1 gram
  - WW bread – 2 grams
  - Oatmeal – 3 grams
- White flour and white potatoes provide the most fiber in the U.S. diet
  - Not b/c concentrated fiber sources, but because widely consumed

There's a need to add functional fiber to foods to reach the recommended dietary fiber goals.

1. Slavin J. Position of the American Dietetic Association: Health Implications of Dietary Fiber. *J Am Diet Assoc. 2008;108:1716-1731.*

Relative Risk of Death From CHD



What Is a Whole Grain?

Bran

"Outer shell"

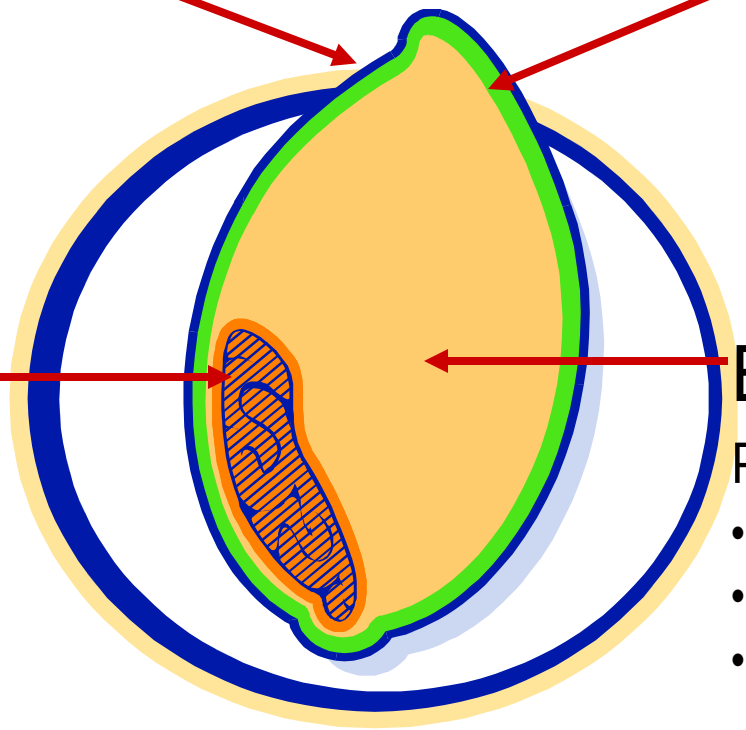
protects seed

- Fiber
- B vitamins
- Trace minerals
- Phytochemicals

Germ

Nourishment for the seed

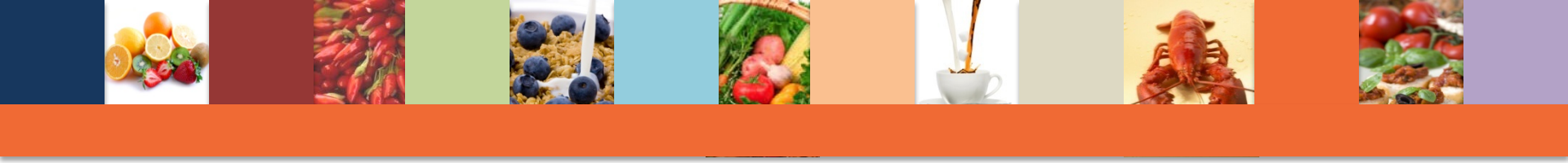
- B vitamins
- Vitamin E
- Trace minerals
- Phytochemicals, antioxidants
- Lipids



Endosperm

Provides energy

- Carbohydrate
- Protein
- Some B vitamins



Whole Grains in the US

- Whole wheat
- Whole oats/oatmeal
- Whole-grain corn
- Popcorn
- Brown rice
- Whole rye
- Whole-grain barley
- Wild rice
- Buckwheat
- Triticale
- Bulgur (cracked wheat)
- Millet
- Quinoa
- Sorghum

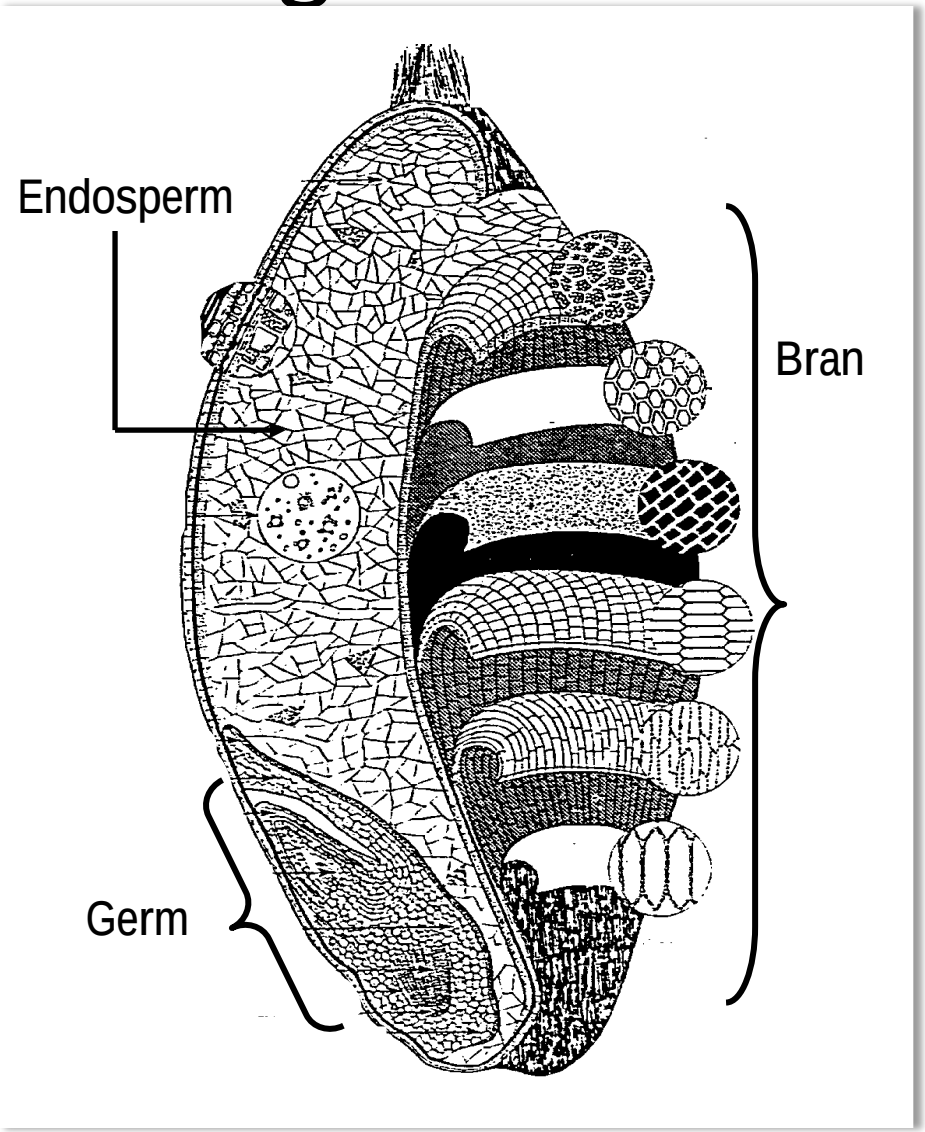
Grain Refining

Milling

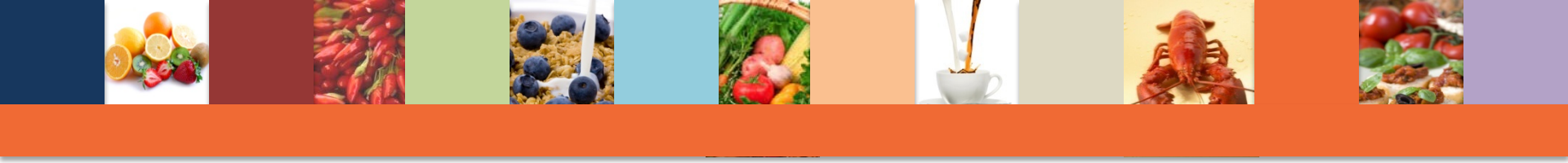
Removal of bran and germ layers.

Nutrients lost:

- Vitamins
- Minerals
- Phenolics
- Fiber



Enhance desirability.
Improve texture, flavor, appearance.
Increase shelf life.



100 g of Whole Wheat Flour &Enriched White Flour

Whole Grain Wheat Flour	Enriched White Flour
339 kcal	364 kcal
12.2 g dietary fiber	2.7 g dietary fiber
34 g calcium	15 g calcium
138 mg magnesium	22 mg magnesium
420 mg potassium	107 mg potassium
44 mcg folate	291 mcg folate

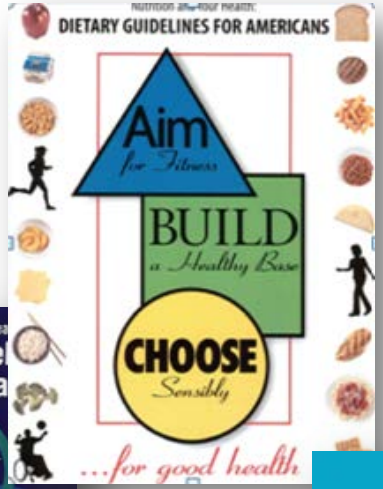
Dietary Guidelines for Americans 1980 - 2010

1980

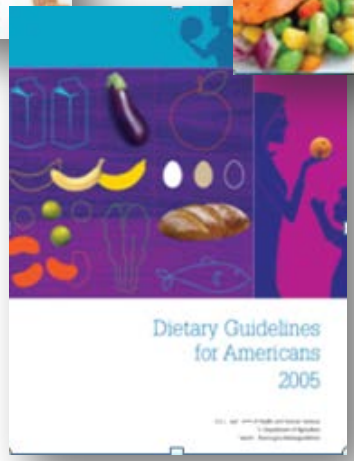
1985

1990

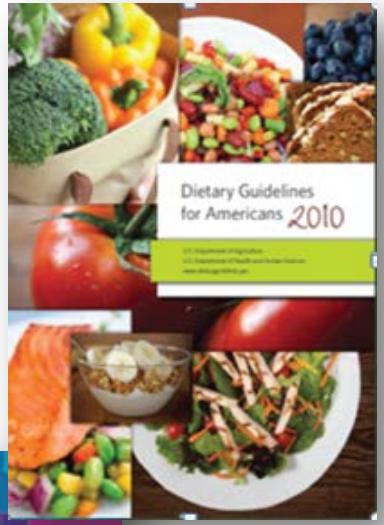
1995



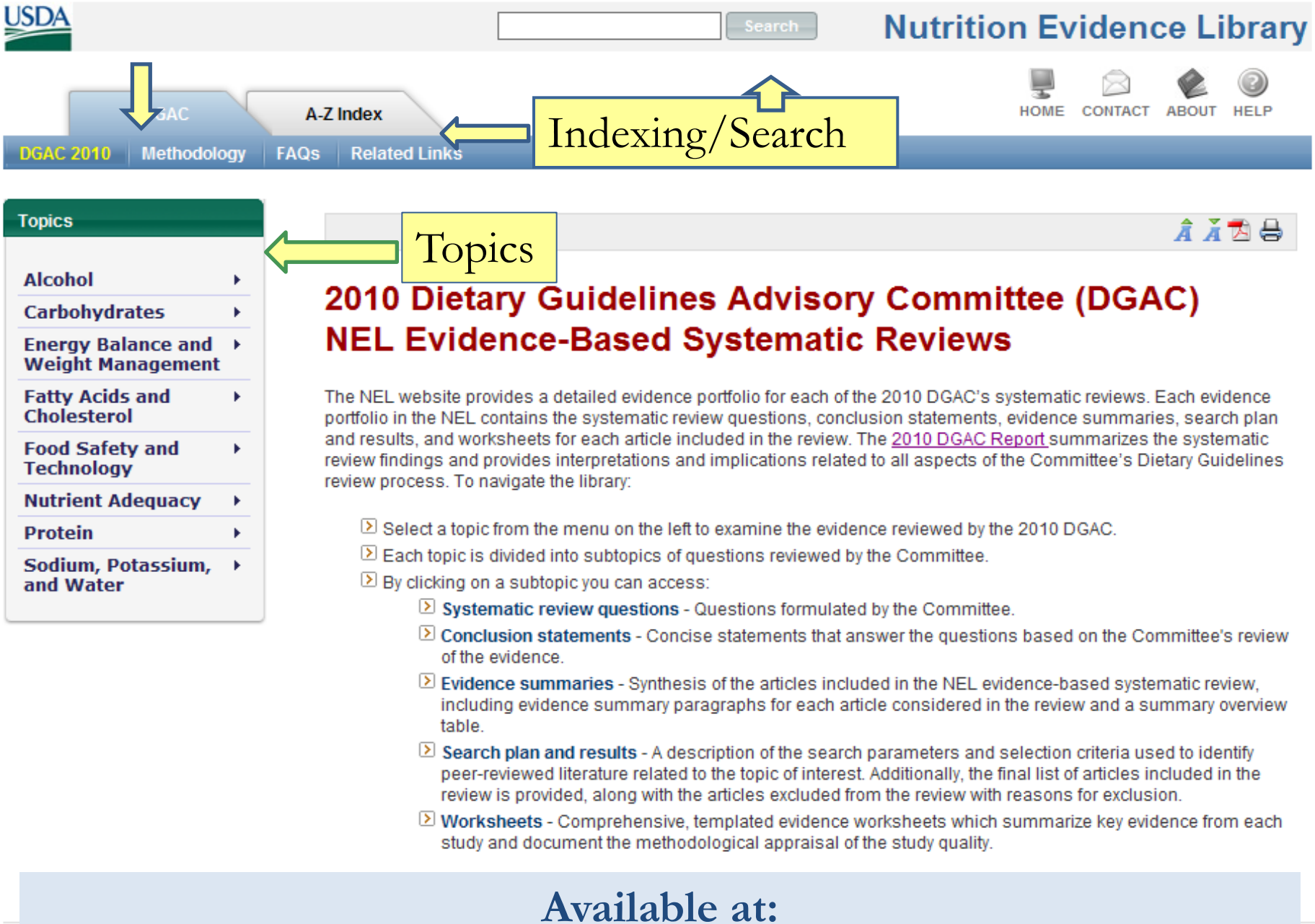
2000



2005

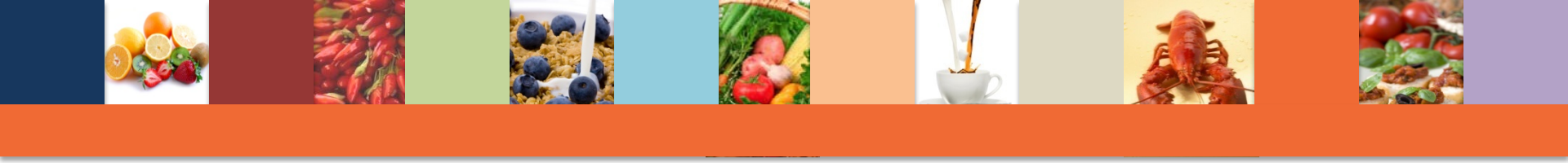


2010



Available at:

www.NutritionEvidenceLibrary.gov



NEL Process

Formulate Systematic Review Questions
- Exploratory searches
- Public comment
- Dialogue with experts
- Analytical Framework
- PICO

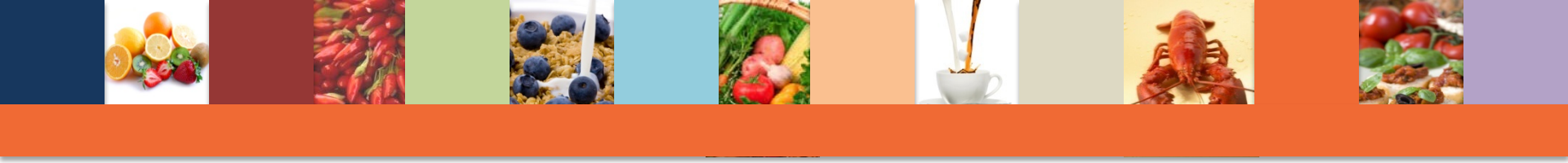
Literature Search and Sort
- Identify study eligibility criteria
- Determine search strategy
- Search for relevant studies
- List included studies
- List excluded studies and rationale

Extract Evidence From Studies
Create evidence worksheets

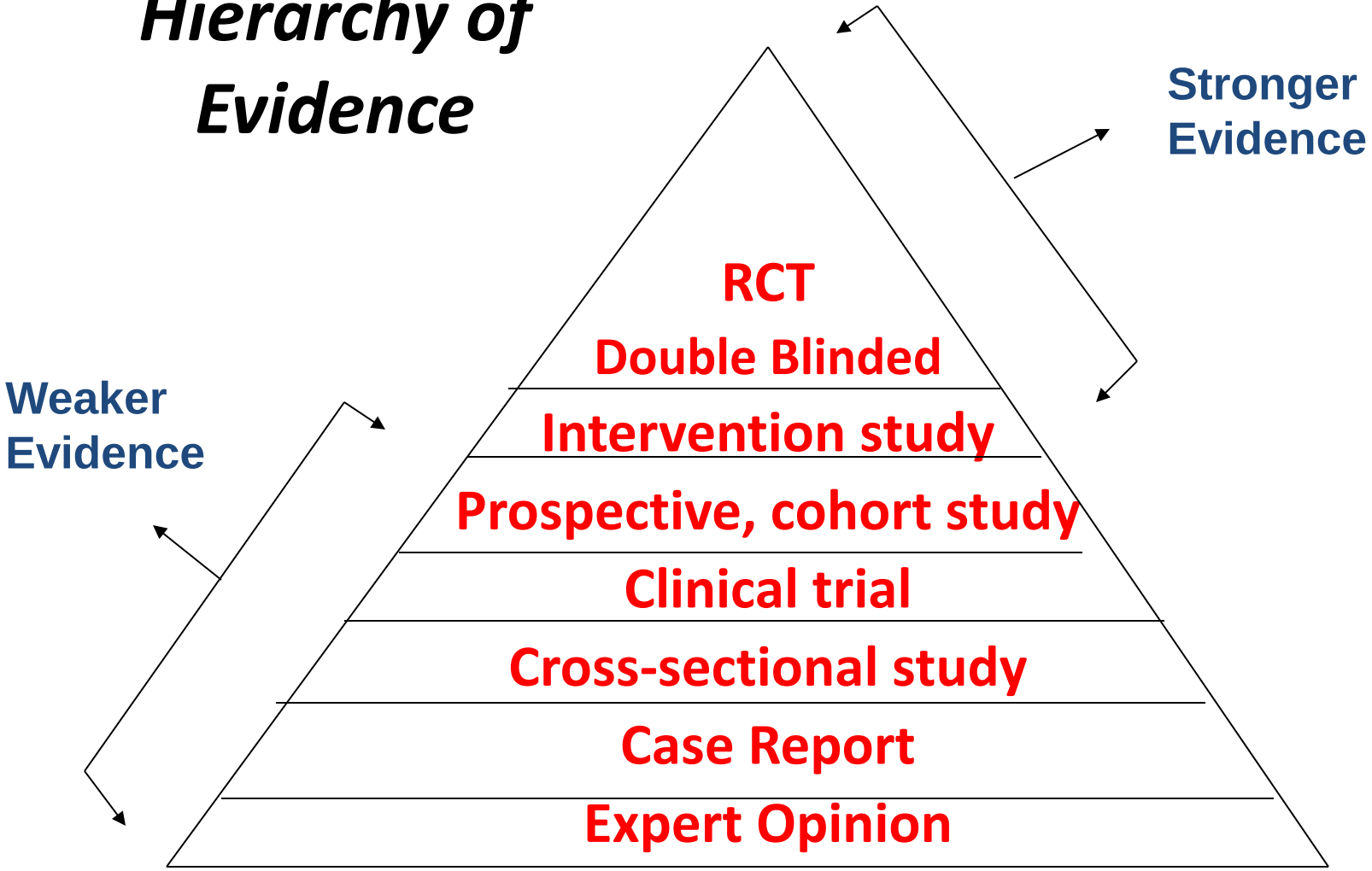
Summarize and Synthesize the Evidence
- Assess quality of individual studies
- Assess applicability
- Summarize and synthesize evidence

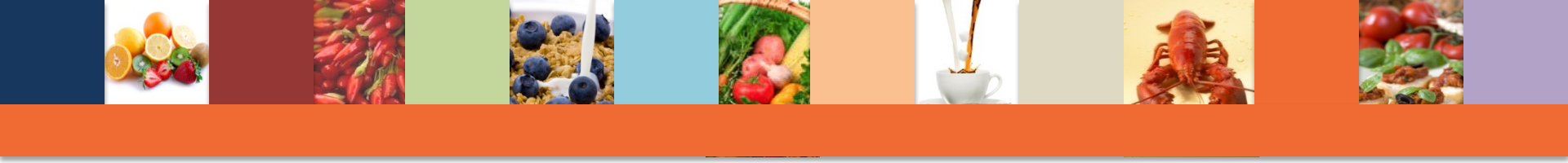
Develop and Grade Conclusion Statements

Define Research Recommendations



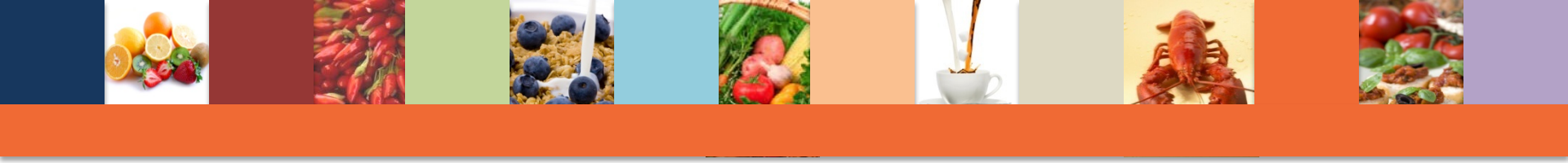
Hierarchy of Evidence





DGAC Carbohydrate chapter summary

- Healthy diets are high in carbohydrate. AMDR for carbohydrates are 45 – 65%. A maximum intake of 25% of added sugars is suggested
- Americans should choose fiber-rich foods such as whole grains, vegetables, fruits, and cooked dry beans and peas as staples in the diet. Dairy products are also a nutrient-dense source of carbohydrates
- Carbohydrates are the primary energy source for active people. Sedentary people, including most Americans, should decrease consumption of caloric carbohydrates to balance energy needs and attain and maintain ideal weight.



ASN Scientific Statement

- Consumption of foods rich in cereal or mixtures of whole grains, and bran is modestly associated with a reduced risk of obesity, T2D, and CVD. The data for whole grain alone are limited primarily because of varying definitions among epidemiological studies what, and how much, was included in that food category
  - Cho et al. *Am J Clin Nutr* 2013;98:594-619

Chapter 3

Foods and Food Components to Reduce

Key Recommendations

Reduce daily sodium intake to less than 2,300 milligrams (mg) and further reduce intake to 1,500 mg among persons who are 51 and older and those of any age who are African American or have hypertension, diabetes, or chronic kidney disease. The 1,500 mg recommendation applies to about half of the U.S. population, including children, and the majority of adults.

Consume less than 10 percent of calories from saturated fatty acids by replacing them with monounsaturated and polyunsaturated fatty acids.

Consume less than 300 mg per day of dietary cholesterol.

Keep *trans* fatty acid consumption as low as possible, especially by limiting foods that contain synthetic sources of *trans* fats, such as partially hydrogenated oils, and by limiting other solid fats.

Reduce the intake of calories from solid fats and added sugars.

Limit the consumption of foods that contain refined grains, especially refined grain foods that contain solid fats, added sugars, and sodium.

If alcohol is consumed, it should be consumed in moderation—up to one drink per day for women and two drinks per day for men—and only by adults of legal drinking age.

Chapter 4

Foods and Nutrients to Increase

Key Recommendations

Individuals should meet the following recommendations as part of a healthy eating pattern and while staying within their calorie needs.

Increase vegetable and fruit intake.

Eat a variety of vegetables, especially dark-green and red and orange vegetables and beans and peas.

Consume at least half of all grains as whole grains. Increase whole-grain intake by replacing refined grains with whole grains.

Increase intake of fat-free or low-fat milk and milk products, such as milk, yogurt, cheese, or fortified soy beverages.[58]

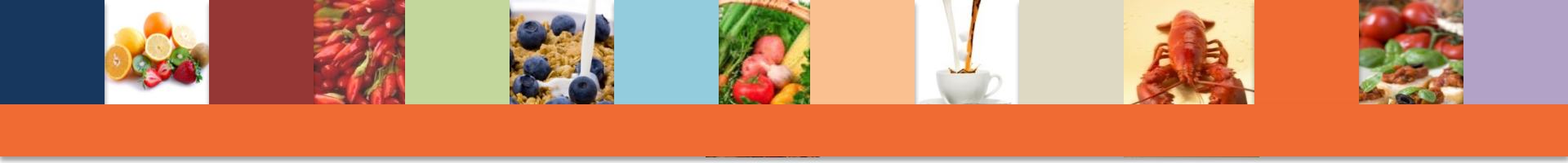
Choose a variety of protein foods, which include seafood, lean meat and poultry, eggs, beans and peas, soy products, and unsalted nuts and seeds.

Increase the amount and variety of seafood consumed by choosing seafood in place of some meat and poultry.

Replace protein foods that are higher in solid fats with choices that are lower in solid fats and calories and/or are sources of oils.

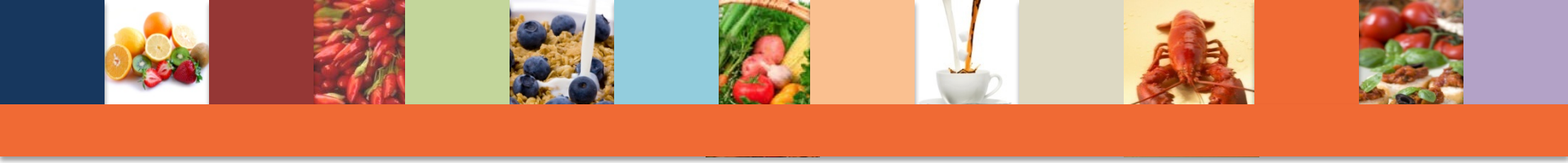
Use oils to replace solid fats where possible.

Choose foods that provide more potassium, dietary fiber, calcium, and vitamin D, which are nutrients of concern in American diets. These foods include vegetables, fruits, whole grains, and milk and milk products.



DGAC 2015

- Settled science – may not see much change on nutrient levels
- Movement to whole foods and away from nutrients
- Topics such as sustainability, gluten, vegan diets (a large number of public testimonies were anti-dairy, anti-wheat, anti-processed foods)



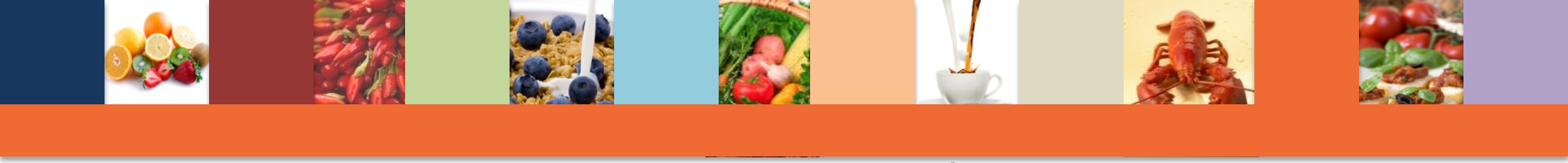
Dietary Guidance—A Historical Perspective

1894 - Dr. Atwater specified amount of protein and total calories in a good diet, but left unspecified the division of calories between fats and carbohydrates

1902 - “evils of overeating may not be felt at once, but sooner or later they are sure to appear – perhaps in general debility, perhaps in actual disease”

1902 - “ordinary food materials…make a fitting diet, and the main question is to use them in the kinds and proportions fitted to the actual needs of the body”

Recommended variety, proportionality and moderation, measuring calories, and an affordable diet focused on nutrient-rich foods, less fat, sugar and starch.



Eating Guides

- 1909 – Politicians get involved! - President William Taft and Congress published a guide to family eating
- 1916 – USDA Food guide for children grouped foods into milk & meat, cereals, vegetables and fruits, fatty foods and fats, sugar and sugary foods. 1917: same food groups recommended for adults.
- 1933—USDA developed food plans of different cost in response to the Great Depression. 12 food groups

1943: Basic Seven

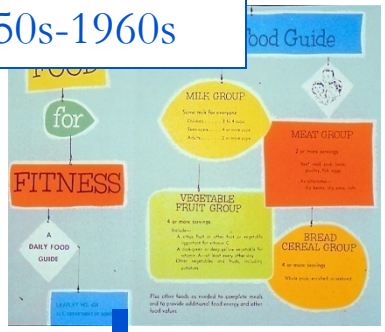
Margaret Mead:

"People don't eat nutrition – they eat food"

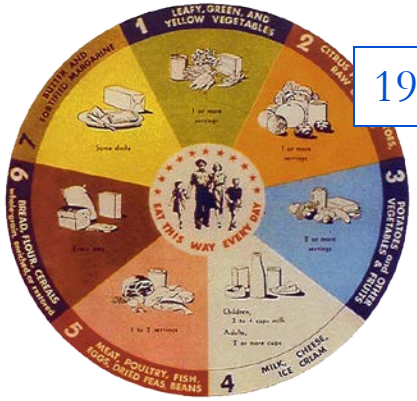
Basic 7 did not specify the number of servings of each food group needed daily

Food advice: Evolution of USDA's Food Guidance – Moderation and Variety

1950s-1960s



1940s

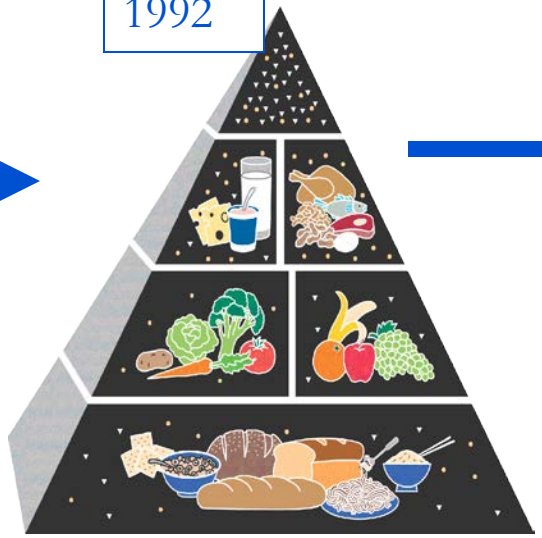


1916

Food for Young Children

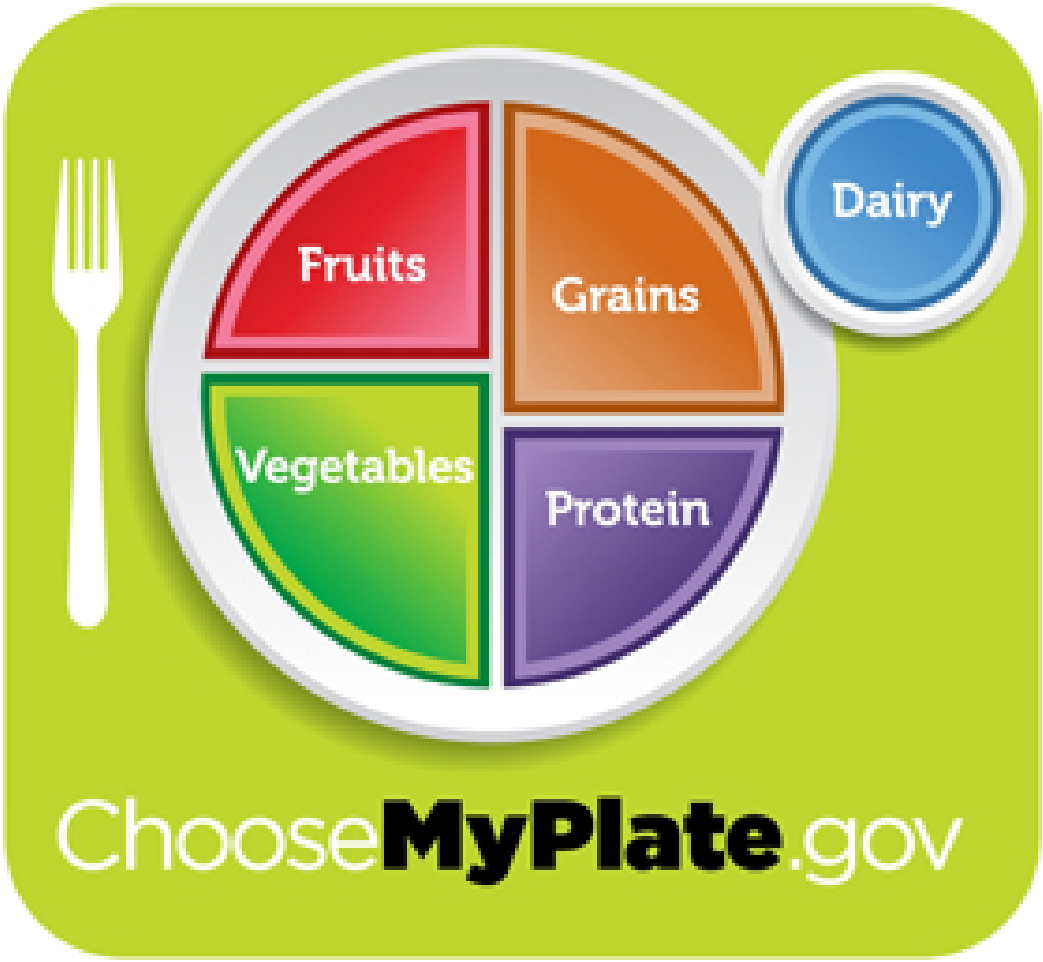
1970s

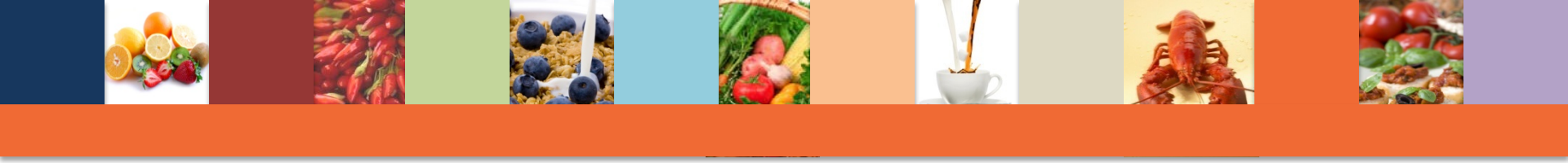
1992



2005

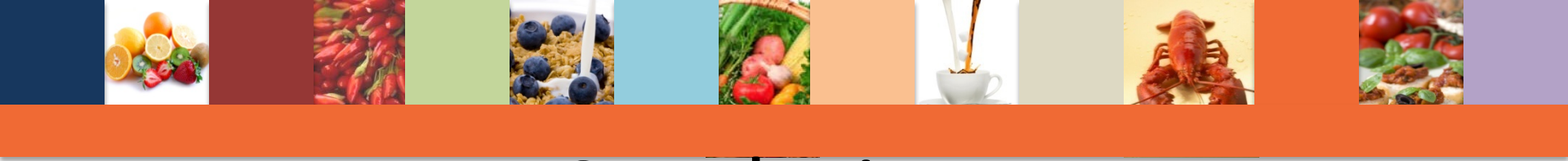
MyPlate.gov (6/2/11)





Toward Healthful Diets, FNB, 1980

- *"The Board expresses its concern over excessive hopes and fears in many current attitudes toward food and nutrition. Sound nutrition is not a panacea. Good food that provides appropriate proportions of nutrients should not be regarded as a poison, a medicine, or a talisman. It should be eaten and enjoyed."*



Conclusions

- High carbohydrate diets are healthy diets
- Dietary guidance supports the consumption of more dietary fiber – whole grains are an important source of dietary fiber
- Substitute whole grains for refined grains, not just eat more grains
- Carbohydrates are supplied in each part of myplate – choose the appropriate amount of carbohydrates/calories rather than rely on strict rules on added sugar, low gluten, low glycemic, etc. or other carbohydrate measures not linked to health outcomes