What to Eat, and Why...

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The Wrap

We've gone through a lot of evidence

Some of it is well-established and compelling

Some of it is tentative but reasonably convincing

Some of it is very preliminary and subject to change

And some of it is still in flux and need further evidence or confirmatory studies

How do we separate the "wheat from the chaff"?

The Goal

To live as long as possible, as well as possible

Formal analysis: Quality-Adjusted Life Year

- "QALY"
- The concept of "trading-off" years of perfect health against years with illness / disability
- Used in health policy decision making to determine the biggest bang for the buck
- Complex; data often insufficient; answer may not be unique

Alternative: Survival analysis, hazard ratio

What can we change?

Coronary heart disease

Stroke

Other vascular disease

COPD (lung)

Alzheimer's disease

Osteopenia

Arthritis

Cancers

- Lung
- Colon
- Breast
- Prostate
- Pancreas
- Lymphoma
- Leukemia
- Head & neck
- Esophagus

What do we die of?

Actual Causes of Death in the United States, 2000

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Context Modifiable behavioral ri
States. Quantifying these will pro
implications of missed prevention

Objectives To identify and qua
States.

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Causes of death (U.S., death certificate)

Table 1. Leading Causes of Death in the United States in 2000*

Cause of Death	No. of Deaths	Death Rate per 100 000 Population
Heart disease	710 760	258.2
Malignant neoplasm	553 091	200.9
Cerebrovascular disease	167 661	60.9
Chronic lower respiratory tract disease	122 009	44.3
Unintentional injuries	97 900	35.6
Diabetes mellitus	69 301	25.2
Influenza and pneumonia	65 313	23.7
Alzheimer disease	49 558	18
Nephritis, nephrotic syndrome, and nephrosis	37 251	13.5
Septicemia	31 224	11.3
Other	499 283	181.4
Total	**2 403 351**	873.1

*Data are from Minino et al.[4]

Underlying causes of death (U.S., analysis)

Table 2. Actual Causes of Death in the United States in 1990 and 2000

Actual Cause	No. (%) in 1990*	No. (%) in 2000
Tobacco	400 000 (19)	435 000 (18.1)
Poor diet and physical inactivity	300 000 (14)	400 000 (16.6)
Alcohol consumption	100 000 (5)	85 000 (3.5)
Microbial agents	90 000 (4)	75 000 (3.1)
Toxic agents	60 000 (3)	55 000 (2.3)
Motor vehicle	25 000 (1)	43 000 (1.8)
Firearms	35 000 (2)	29 000 (1.2)
Sexual behavior	30 000 (1)	20 000 (0.8)
Illicit drug use	20 000 (<1)	17 000 (0.7)
Total	**1 060 000** (50)	**1 159 000** (48.2)

*Data are from McGinnis and Foege.[1] The percentages are for all deaths.

What Makes a Difference?

Fiber

Saturated Fat

Polyunsaturated Fat

Monounsaturated Fat

Trans-Fat

Protein

Alcohol

Sugar Beverages

Starches

Dairy

Sodium

Refined Grain

Whole Grain

Nuts

Legumes

Vegetables

Fruits

Red meat

Processed meat

Poultry

Fish

Calcium

How do we decide?

Evidence-based

- Observational studies: association
- Experiments (controlled trials) : causality

Evidence is incomplete

Evidence is conflicting

Controlled trials not practical to address many important issues

"Recent research finds there are no answers"

Inferring causality from observational data

It's impossible, or impractical, to do experiments regarding every issue of practical importance

What if we were able to obtain high-quality observational data, analyze it appropriately, and supplement it with other evidence?

- Develop criteria for "accepting" such evidence
- Sir Austin Bradford Hill, a great pioneer in medical statistics and epidemiology, developed criteria

Bradford Hill Criteria

Strength: A small association does not mean that there is not a causal effect, though the larger the association, the more likely that it is causal.

Consistency: Consistent findings observed by different persons in different places with different samples strengthens the likelihood of an effect.

Specificity: Causation is likely if a very specific population at a specific site and disease with no other likely explanation. The more specific an association between a factor and an effect is, the bigger the probability of a causal relationship.

Temporality: The effect has to occur after the cause (and if there is an expected delay between the cause and expected effect, then the effect must occur after that delay).

Biological gradient: Greater exposure should generally lead to greater incidence of the effect. However, in some cases, the mere presence of the factor can trigger the effect. In other cases, an inverse proportion is observed: greater exposure leads to lower incidence.

Plausibility: A plausible mechanism between cause and effect is helpful (but Hill noted that knowledge of the mechanism is limited by current knowledge).

Coherence: Coherence between epidemiological and laboratory findings increases the likelihood of an effect. However, Hill noted that "... lack of such [laboratory] evidence cannot nullify the epidemiological effect on associations".

Experiment: "Occasionally it is possible to appeal to experimental evidence".

Analogy: The effect of similar factors may be considered.

Causal association for diet & CHD

Table 5. Summary of the Evidence of a Causal Association Between Diet and Coronary Heart Disease, as Determined From Examination of Prospective Cohort Studies Using the Bradford Hill Guidelines and Consistency With Findings From RCTs[a]

Evidence of a Causal Association From Cohort Studies	Cohort Data Only	Supported by RCTs
Strong		
"Mediterranean" diet[b]		Yes
High-quality diet	✓	
Vegetables	✓	
Nuts	✓	
Trans–fatty acids	✓	
Glycemic index or load	✓	
"Prudent" diet[c,d]	✓	
"Western" diet[d,e]	✓	
Monounsaturated fatty acids[d]	✓	
Moderate		
Fish		No
Marine ω-3 fatty acids		Yes
Dietary folate	✓	
Supplementary folate		RCT data only
Whole grains	✓	
Dietary vitamin E	✓	
Dietary beta carotene	✓	
Supplementary beta carotene		RCT data only
Dietary vitamin C	✓	
Alcohol, light/moderate consumption	✓	
Alcohol, heavy consumption	✓	
Fruits	✓	
Fiber	✓	
Weak		
Supplementary vitamin E		Yes
Supplementary ascorbic acid		Yes
Total fat		Yes
Saturated fatty acids	✓	
Polyunsaturated fatty acids		Yes
ω-3 Fatty acids, total		No[f]
Meat	✓	
Eggs	✓	
Milk	✓	

Foods to embrace

Order of presentation reflects my preferences and biases

YMMV

- Everyone is different; what works for me may not work for you

20/80 Rule

- 80% of the results come from 20% of the effects
- You don't have to change everything; tweak the important ones

Alcohol

Two-edged sword with respect to health, namely:

Excess consumption is unfavorable…

- Binge drinking and regular consumption of six or more drinks per day
- Increased risk of liver disease, certain cancers, automobile collisions

But moderate consumption (1-2 drinks/day) is favorable

- Substantial lowering of CHD and diabetes, possibly dementia
- Modification of lipid metabolism is a recognized beneficial mechanism
- For a healthy individual spontaneously consuming alcohol in a restrained and responsible manner, there is no health-related reason to discontinue
- Someone not spontaneously drinking alcohol is not advised to begin drinking for health promotion
- Highest rate of moderate alcohol use is in more affluent, more highly educated

Nuts

Easy way to add goodness to your diet

- Fuel, good fats, protein, fiber – all good for you

Highly associated with benefit – peanuts as well as all tree nuts; nut butter as well, but look out for added sugar

Good snack – travels well, stores easily without spoiling

Only downside is those with nut allergies

"But nuts are loaded with fat" → "Fuhgeddaboudit"

- It's hard for some folks to accept that fats are OK

How much? An ounce of nuts or one tbsp nut butter

Whole-grain breakfast cereal

Another easy way to add goodness

Highly associated with benefit

Excellent source of grain-based fiber

Many cereals include dried fruits and nuts

- Or add your own !!

Avoid *refined* grain cereal – not beneficial

- Possible exception: Add bran, germ, nuts, fruits

Add a tablespoon of bran for extra fiber

How much? ½ to 1 cup

Whole-grain products

Highly associated with benefit

- How much is due to fiber, how much to other things (e.g., phytosterols)?

Provides substantial amount of grain fiber

Inexpensive fuel source

Good variety available: whole-wheat breads, brown rice, whole-grain pasta, quinoa, popcorn

Look for whole-grain stamp on package to determine amount of whole-grain per serving of each product

Glycemic index for a given product may not be as low as you'd expect, so best consumed as part of a complete meal with other sources of fat and protein

How much? 75 g/day of whole-grain, which typically provides about 10-15 g of dietary fiber

Fish

Provide essential omega-3 fatty acids DHA & EPA

Highly associated with benefit, but with variation by species

- Cold water ocean fish have highest omega-3 levels

Benefit cannot be obtained simply by taking fish-oil supplements

Canned pink salmon, canned tuna, frozen fish especially cost-effective and convenient for storage and transport

Fish that don't provide much n-3, such as tilapia or shrimp, can be a good meat alternative (vitamin B-12, other vitamins, protein, satiety)

Mercury content must be considered for young children, pregnant women and nursing mothers

How much? Two servings of appropriate fish per week will provide adequate amounts of omega-3 (about 250 mg DHA+EPA per day)

Vegetables

Highly associated with benefit

Veggie's role is to provide micronutrients (vitamins, minerals, phytosterols, antioxidants) and fiber; little energy

Great variety to meet individual tastes and preferences

How much? 3 or more servings a day

Fruits

Highly associated with benefits

Fruit's role is to provide micronutrients (vitamins, minerals, phytosterols, antioxidants) and fiber

Some fruit has substantial energy (carbs) and some has high glycemic index

Fruit juice doesn't provide the benefit of whole fruit, and may be counter-productive due to sugar

"Contains no added sugar" is a marketing slogan; natural sugar is just as detrimental as added sugar

Be wary of canned fruits (& ? frozen fruits)

- Have been linked to increased mortality in some studies, possibly due to sugar content

How much? 2 or more servings a day

Legumes (beans)

Moderately associated with benefits

Good source of protein

- Provides complete protein in combination with corn

Good source of fiber

Processed into textured meat substitutes, especially soy

Intestinal side effects in some people limit intake

How much? As much as you want (or can tolerate)

Dietary fiber

Indigestible carbohydrates

- Cellulose, lignins – insoluble: bulking agents
- Polysaccharides – soluble: consumed by friendly gut micro-organisms (microbiome), which in turn promotes gut integrity and immune competence, lowers cholesterol through elimination of bile salts

Sources

- Vegetables, fruits, legumes, grains
- Absent from meat, eggs, dairy, sugar, refined carbohydrates

Prebiotics: Foods rich in soluble fiber that "feed" your microbiome

How much? 25 g/d women, 30 g/d men

Tips:

- More is better; upper limit set by tolerance of bloating, flatulence; tolerance with regular consumption
- Grain-sourced fiber may be more beneficial than F&V, legumes
- Read the Nutrition Facts label for dietary fiber and total carbohydrates
- Multiply fiber by 10; if result is greater than total carbs, food is a desirable source of fiber
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Fats / Oils

Essential fatty acids are needed in appropriate amounts

- Marine omega-3 – discussed with Fish
- Alpha-linolenic acid, the plant-source omega-3, is essential: 2-3 g/d is good
- Linoleic acid, omega-6, is essential: about 3% of energy (6 g/d) is good; up to 10% (20 g/d) is OK; higher amounts are considered harmful by some; U.S. diets often have more

Saturated fats are a widely available (dairy, meats), inexpensive source of fuel

- No longer considered lethal and to be avoided at all costs
- Then again, probably wise not to go overboard (10-15% of energy is OK)

Monounsaturated fatty acids can make up the balance

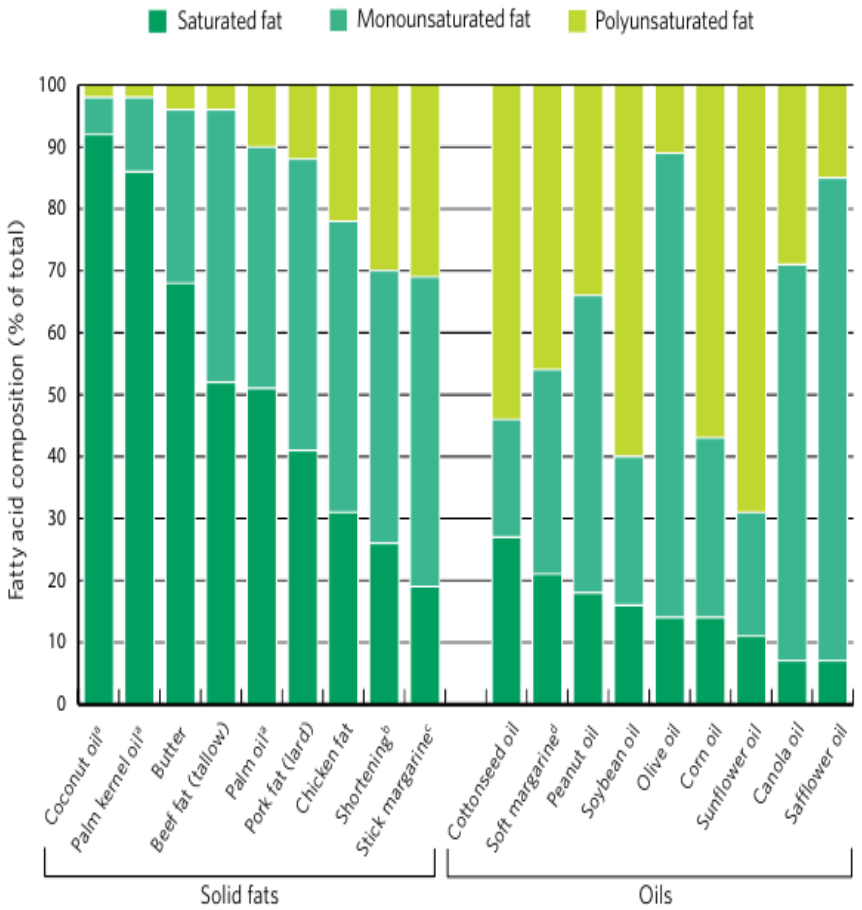
How much? Fats and oils can reasonably make up about 35-40% of your energy quota (approximately 85 gm/d for a 2000 cal diet)

Fats / Oils

Doesn't require a lot of specific attention, except to make sure essential fatty acid amounts are obtained

- Fish with good EPA/DHA twice a week
- Looks for alpha-linolenic acid (ALA) foods, with goal of about 2 g/d (PUFA)
- Trim excess fat off meat
- Low-fat milk

FIGURE 3-3. Fatty Acid Profiles of Common Fats and Oils



Poultry

Chicken, turkey, game birds

No exceptional benefit or risk

Good source of high-quality protein and micronutrients (vitamin B-12)

How much? One or two servings daily

Dairy

No exceptional benefit or risk

Excellent source of calcium, vitamin D

Inexpensive source of energy (fat), though it's mostly saturated fat

Fermented milk products (e.g., cheese, yogurt) may have special benefits; the specific strain may be important

Dairy spreads (butter) on bread may have risks

How much? One or two servings a day

Eggs

No exceptional benefit or risk

Source of good-quality protein

High content of cholesterol

- Possibly not the risk earlier thought, but caution for individuals with lipid problems

How much? Two servings a week

The Undesirables

Didn't say “Untouchables”; just proceed with caution; quality, not quantity

Eat mindfully, consciously: eat slowly, chew well and savor the flavor

Potatoes

Associated with little benefit

Predominately starch

- Inexpensive energy source
- Rapidly digested, absorbed – high glycemic index / glycemic load

Cooking method influences GI/GL

Relatively little fiber

How much? Once or twice a week

Red meat

Beef, pork, lamb

Provides high-quality protein, micronutrients (vitamin B-12, iron)

Associated with risks

- Carnitine in meat is converted by gut microbes to TMA, which a liver enzyme turns into TMAO
- TMAO promotes atherosclerosis, diabetes

How much? Once or twice a week

Processed meat

Hot dogs, sausages, cold cuts, luncheon meats, bacon

- Unclear if processed poultry conveys risk

Highly associated with risks

Mechanism unclear

- Salt, preservatives (nitrites) ?

How much? Once or twice a week

Refined grains

White bread, white rice, desserts, pasta, sugar

High glycemic index / glycemic load

- Provokes insulin demand; associated with insulin resistance

Excess carbs converted in the body into undesirable fats (triglycerides, cholesterol)

Sugary beverages, including fruit juices, are best avoided

How much? 10% of energy (50 gm/d on 2000 cal diet)

Doing the math

If you need to subtract something, figure out what you'll replace it with

- Less meat → more poultry
- Less refined grains → more whole grains

If you need to add something, figure out what you'll need to cut back on

- More nuts → less tortilla chips and sour cream dips
- More veggies → no need to cut back on anything, though you may feel satisfied with less calorie-containing snacks

What about weight loss?

Why do you want to lose weight?

- Recent analysis shows no specific risk for BMI up to 35; in fact, BMI 25.0-29.9 had lower all-cause mortality than reference 18.5-24.9

Permanent favorable changes in diet may forestall or reverse fat deposition

- Reduction of glycemic load

Short-term weight loss is relatively easy on fad diets, but relapse is nearly universal without durable diet revision

Mediterannean diet criteria

	Frequency[1]
1. Do you use olive oil as the principal source of fat for cooking?	Yes
2. How much olive oil do you consume per day (including that used in frying, salads, meals eaten away from home, etc.)?	≥4 Tbsp[5]
3. How many servings of vegetables do you consume per day? Count garnish and side servings as 1/2 point; a full serving is 200 g.	≥2
4. How many pieces of fruit (including fresh-squeezed juice) do you consume per day?	≥3
5. How many servings of red meat, hamburger, or sausages do you consume per day? A full serving is 100–150 g.	<1
6. How many servings (12 g) of butter, margarine, or cream do you consume per day?	<1
7. How many carbonated and/or sugar-sweetened beverages do you consume per day?	<1
8. Do you drink wine? How much do you consume per week?	≥7 cups[6]
9. How many servings (150 g) of pulses do you consume per week?	≥3
10. How many servings of fish/seafood do you consume per week? (100–150 g of fish, 4–5 pieces or 200 g of seafood)	≥3
11. How many times do you consume commercial (not homemade) pastry such as cookies or cake per week?	<2
12. How many times do you consume nuts per week? (1 serving = 30 g)	≥3
13. Do you prefer to eat chicken, turkey or rabbit instead of beef, pork, hamburgers, or sausages?	Yes
14. How many times per week do you consume boiled vegetables, pasta, rice, or other dishes with a sauce of tomato, garlic, onion, or leeks sautÕed in olive oil?	≥2
Mean	—

Score one point for each criterion met

Add up points

14 is "perfect" score

Every 2 point increase in score is associated with 8% decrease in mortality

Average adherence is ~6

Note: "cup" = 100 ml, about 3.5 fl. oz.

What about vegan, vegetarian,...?

Practiced by <5% of the population

- Insufficient data to make statistically meaningful assessments

Incorporates many of the beneficial aspects of diet identified in omnivores

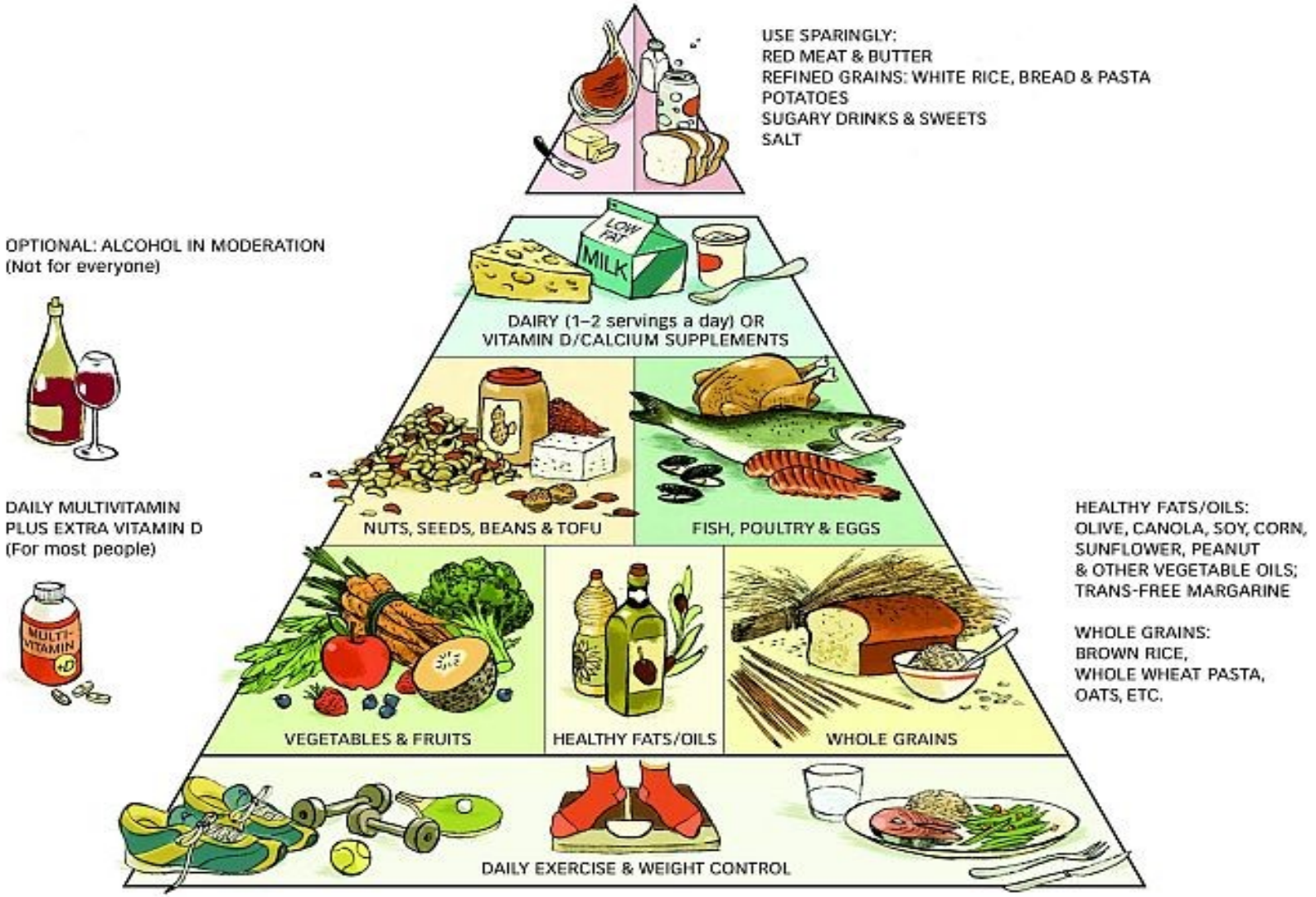
- Reduced red meat, increased vegetables and fruits

Requires careful attention to get sufficient quality protein, certain vitamins (esp. B-12)

Vegan cannot provide marine omega-3

Contributes to sustainable living: lower impact on the enviroment, more people can be fed with the same resources

Thank you!


USE SPARINGLY:
RED MEAT & BUTTER
REFINED GRAINS: WHITE RICE, BREAD & PASTA
POTATOES
SUGARY DRINKS & SWEETS
SALT
OPTIONAL: ALCOHOL IN MODERATION
(Not for everyone)
DAILY MULTIVITAMIN
PLUS EXTRA VITAMIN D
(For most people)
LOW FAT
MILK
DAIRY (1–2 servings a day) OR
VITAMIN D/CALCIUM SUPPLEMENTS
NUTS, SEEDS, BEANS & TOFU
FISH, POULTRY & EGGS
MULTI-VITAMIN
+D
VEGETABLES & FRUITS
HEALTHY FATS/OILS
WHOLE GRAINS
HEALTHY FATS/OILS:
OLIVE, CANOLA, SOY, CORN,
SUNFLOWER, PEANUT
& OTHER VEGETABLE OILS;
TRANS-FREE MARGARINE
WHOLE GRAINS:
BROWN RICE,
WHOLE WHEAT PASTA,
OATS, ETC.
DAILY EXERCISE & WEIGHT CONTROL