Chapter 1
The Science of Nutrition: Linking Food, Function, and Health

What Is Nutrition?
Study of ____________________________
_________________________ is the plants and animals we ________________
Nutrition is the science that studies food:
How food ________________ our bodies
How food influences our ____________________
Includes identifying how we ________________, ________________, ________________, and ________________ nutrients
Includes studying our ________________ patterns and making recommendations

Why Is Nutrition Important?
Proper nutrition supports ____________________________
Wellness is more than the absence of _______________________
Includes physical, emotional, and spiritual health
Is a multidimensional, lifelong process
Two key components of wellness that we examine:
1. ________________________________
2. ________________________________
Can improve health and prevent ______________________
One of several factors supporting wellness
Can __________________ some diseases and reduce risk for others
Relationship between poor nutrition and disease:
Nutrition is part of the U.S. national health promotion and disease prevention plan: Healthy People (updated every 10 years)

Healthy People 2020
Four primary goals:
Help people attain higher quality and longer lives, via prevention of disease, disability, injury, and premature death
Achieve health equity; improve __________________________ for all
Create social and physical environments that promote health
Promote quality of life, healthy development, and healthy behaviors across all life stages

What Are Nutrients?
Nutrients are

Organic nutrients
**Inorganic nutrients**
are those not containing __________________ and __________________; they include minerals and water.

Six groups of nutrients found in foods:

**Organic:**

**Inorganic:**

What is the difference between essential and nonessential nutrient?

**Essential nutrients:** nutrients for which specific biological functions have been identified, and which our bodies cannot make enough of to meet our biological needs.

**Nonessential nutrient:** ?

**Macronutrients** are required in relatively large amounts

Provide ______________________________ to our bodies

**Carbohydrates, lipids, and proteins**

**Micronutrient**?

**Carbohydrates**
Primary __________ source for the body, especially for ________________ functioning and physical ________________

Composed of chains of carbon, hydrogen, and oxygen

Found in grains (wheat, rice), vegetables, fruits, legumes (lentils, beans, peas), seeds, nuts, and milk products

**Lipids**
A diverse group of substances that are largely __________________ in water

Includes triglycerides, phospholipids, and sterols

Composed of carbon, hydrogen, and oxygen

Main energy source during ________________ or low- to moderate-intensity ________________

Stored as adipose tissue (______________________)

Provide fat-soluble vitamins

**Proteins**
In addition to carbon and hydrogen, proteins also contain __________________
Macronutrients: typically a primary energy source; important in building new cells/tissues, maintaining bone, repairing damage, and regulating metabolism and fluid balance

Found in many foods, particularly meat, dairy, seeds, nuts, and legumes; small amounts in grains and vegetables

Micronutrients: compounds that assist in regulating body processes:

- Build and maintain healthy bones and tissues
- Support immune system
- Ensure healthy vision
- Do not contain or supply energy to our bodies
- Help us utilize the energy derived from macronutrients
- Can be destroyed by light, heat, air, etc.

Two types: ________-soluble and ________-soluble

Micronutrients: substances required for body processes:

- Regulate fluid and energy production
- Support bone and blood health
- Remove harmful metabolic by-products
- Exist in the simplest possible form; can't be broken down further or destroyed by heat/light

Two types: ___________ and ___________ minerals

Micronutrient: A vital ___________ nutrient supporting all body processes:

- Fluid balance
- Energy production
- Regulation of nerve impulses, body temperature, and muscle contractions
- Nutrient transport
- Excretion of waste products

Sources include water in its pure form, juices, other drinks, and many foods.

What about Alcohol?

Alcohol

Various distilled products and drugs

Provides some ___________

Energy yielding (___Kcal/g)

Why is it not a nutrient?

**It is ________ vital for life**

- Does not support regulation of body functions or the building or repairing of tissues
- Considered to be both a drug and a toxin

Energy From Nutrients

How do we measure Energy content in food?

We measure energy in _________________ (kcal).

_______________: amount of energy required to raise the temperature of 1g of water by 1°C.
On food labels, “Calorie” actually refers to kilocalories. Now that we know the different classes of nutrients that are required, how much are we required to eat?

Determining Nutrient Needs

**Dietary Reference Intakes (DRIs):** updated nutritional standards

- Expanded on the previous RDA values
- Set __________________ for nutrients that do not have RDA values
- Dietary standards for __________________ people only
- Aim to __________________ deficiency diseases and __________________ chronic diseases

Dietary Reference Intakes (DRIs) consist of:

1. **Estimated Average Requirement (EAR):**
   - The average daily intake level of a nutrient to meet the needs of _______ of the healthy people in a particular life stage or gender group
   - Used to define the Recommended Dietary Allowance (RDA) of a nutrient

2. **Recommended Dietary Allowance (RDA):**
   - The average daily nutrient intake level that meets the needs of ______% to ____% of healthy people in a particular life stage and gender group

3. **Adequate Intake (AI):**
   - Recommended average daily nutrient intake level
   - Based on observed and experimentally determined estimates of nutrient intake by a group of healthy people
   - Used when the ______ is not available: calcium, vitamin D, vitamin K, and fluoride

4. **Tolerable Upper Intake Level (UL):**
   - Average daily nutrient intake level likely to pose no risk of adverse health effects to most people
   - Consumption of a nutrient at levels above the UL increases the potential for ______ effects and health risks increases

5. **Estimated Energy Requirement (EEN):**
   - Average dietary ______ intake to maintain energy __________ in a healthy adult
   - Defined by age, gender, weight, height, and level of physical activity

6. **Acceptable Macronutrient Distribution Ranges (AMDR):**
   - Ranges of energy intakes from __________ that are associated with reduced risk of chronic disease while providing adequate intakes of essential nutrients
   - If nutrient intake falls outside this range, there is a potential for increasing our risk for poor health

Let’s learn how to calculate total calories in food and learn how to calculate percent intake of each energy yielding nutrient.

How many Calories are in each energy yielding nutrient?

- Carbohydrates: ___ kcal/gram
- Lipids: ___ kcal/gram
Proteins  ____ kcal/gram
Alcohol  ____ kcal/gram

Calculating Total Calories
Per serving

Calculate percent of carbs, proteins, and fat.
Per serving

Now how do we know whether or not we are meeting those nutritional needs?

Assessing Nutritional Status
Nutrition professional must have a thorough understanding of a client's current nutritional status

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Ratio of ______ body tissue to body ______
____________ of energy and nutrients

Foundation of recommended dietary and _______________ changes
______________ for evaluation

What is the purpose for nutritional assessment?
The purpose for assessment is to see if a person is suffering from ________________

**Nutritional status is ______ of balance:** too much or too little of a particular nutrient or energy over a significant period of time

_______________: too little energy or too few nutrients over time, causing weight loss or a nutrient-deficiency disease

_______________: too much energy or too much of a given nutrient over time, causing obesity, heart disease, or nutrient toxicity

Let’s check out some assessment tools.
Examinations

Should be conducted by _________________ healthcare providers
Tests depend on client’s medical history, disease symptoms, and risk factors
Typical tests include vital signs, lab tests, heart and lung sounds
Nutritional imbalances may be detected by examining hair, skin, tongue, eyes, and fingernails

Assessments

Provide _________________ data
Common measurements include height, body weight, head circumference in infants, and limb circumference
Require _________________ personnel and _________________ tools
Compare standards specific for age/gender
Assess trends in nutritional status/growth

Questionnaire

Tool for cataloging history of health, illness, drug use, exercise, and diet
Can be used to assess energy and nutrient intakes
Information includes:
  Age, height, weight, medications (present & past)
  Family heath/disease history, exercise history
  _________________ factors (race/ethnic background, education level, marital status, etc.)

Other Dietary _________________ Tools

Additional techniques to assess nutrient and energy intakes:
  _________________ history
  Interview or questionnaire
  _________________ dietary recall
  _________________ questionnaire
  Determines typical pattern over a predefined period of time
  _________________ records
  Food Diary for 3-7 days

Remember the purpose for assessment is to see if a person is _________________.

Nutrition Deficiencies

_______________ deficiency occurs when a person does not consume enough of a nutrient, a direct consequence of inadequate intake

_______________ deficiency occurs when:
  A person cannot _________________ enough of a nutrient in his or her body
  Too much of a nutrient is _________________ from the body
  A nutrient is not _________________ efficiently by the body

Deficiency Symptoms

_______________ deficiency occurs in the early stages; few or no symptoms are observed
_______________ symptoms are hidden and require laboratory tests or other invasive procedures to detect
Symptoms of nutrition deficiency that become obvious are ____________

How does a scientist gain knowledge about nutrition?

**Scientific Method**

To ensure that certain standards and processes are used in evaluating claims, the researcher:

1. Makes an ________________ and ________________ a phenomenon
2. Proposes a ________________ (educated guess) to ________________ the phenomenon
3. Develops an experimental ________________ to ________________ the hypothesis
4. ________________ and ________________ data to ________________ or ________________ the hypothesis

If the data are rejected, an ________________ hypothesis is proposed and tested

If the data support the original hypothesis, a ________________ is drawn

The experiment must be ________________, so other researchers can obtain similar results

**Well-Designed Experiment**

The __________________________ (number of people being studied) should be adequate to ensure that the results obtained are not due to chance alone

A ________________ group is essential for comparison between treated and untreated individuals

**Control for other ________________** is applied to avoid coincidentally influencing the results

**Advancing a Theory**

A ________________ that is consistently supported by repeated experiments becomes a theory

A ________________ represents a scientific consensus (agreement) of why a phenomenon occurs

Theories can be challenged and changed as scientific knowledge evolves

**Types of Research Studies**

**Human studies:**
- Difficult to control for ______ of the _______________________
- Humans have long life spans

**Animal studies**
- ________________ information for designing and implementing human studies
- Research that cannot be done with humans
- Drawbacks: results may not apply directly to humans; ethical implications of animal studies

**______________ studies:**
- Involve assessing nutritional habits, disease trends, or other health phenomena of large populations
- Determine the factors that may influence these phenomena

**______________ studies** are more complex observational studies with additional design features
- Compare a group of individuals with a particular condition to a similar group without the condition

**______________ trials** are tightly controlled experiments
- ________________ group receives an intervention/treatment
- ________________ group is not given an intervention/treatment

**Other Aspects of Research Studies**
Key aspects in evaluating clinical trials:

**Randomized trials**: Researchers randomly assign participants to the treatment and control groups; reduces the possibility of favoritism and errors.

**Blind experiments**: Participants are not aware of which (if any) treatment is being given.

**Double-blind experiments**: Both the participants and the researchers are not aware of which group is getting a treatment.

Evaluating Media Reports

Conflict of interest

Key questions to ask:

- ______/what group conducted the study?
- ______ paid for it?
- Was the study funded by a company or corporation that stands to profit from the results?
- Did the researchers receive good, services, money, or perks from the research sponsor?
- Do the researchers have investments or ties to companies or products related to the study?

Website reliability; separating internet fact from fiction

Check ______ of website sponsors and/or information suppliers

- Qualified professionals? Are financial contributors' names available? Is there expert review of content?

Check website date

- Is it ______? Is information subject to change over time? Should it be consistently updated?

Check sources of information (for-profit or not?)

- Look for "________"/"________"/"________" as reliable designations

More ways to discern truth from fiction:

- Who is reporting the information?
- Is the report based on reputable research studies?
- Is the report based on testimonials?
- Are the claims too good to be true?

**__________:** promotion of an unproven product or service -- usually by an unlicensed or untrained source -- for financial gain

Trustworthy Nutrition Experts

Reliable experts have education and credentials, such as:

- Registered dietician (RD)
- Licensed dietician: meets state credentialing requirements
- Professional with an advanced, related degree: master's or doctorate degree (MA, MS, PhD)
- Medical doctor/physician

"_________" has no legal definition or laws regulating it

Government Information Sources

Government-affiliated online sources (".gov") are considered reliable, such as:

- Centers for Disease Control and Prevention (CDC)
- National Health and Nutrition Examination Survey (NHANES)
- Behavioral Risk Factor Surveillance System (BRFSS)
- National Institutes for Health (NIH)
Chapter 2
Designing a Healthful Diet
A Healthful Diet
A healthful diet provides the proper combination of __________________ and __________________
A healthful diet is: ________________________________
   An __________________________ diet provides enough energy, nutrients, fiber, and vitamins to maintain a
   person's health
   ________________________________ occurs if a person's diet contains inadequate levels of several
   nutrients for a long period of time
A Healthful Diet Is ____________________________
   ____________________________ refers to eating any foods in moderate amounts—not too much and not too
   little
     Moderate ____________ eliminate
A Healthful Diet Is ____________________________
A __________________________ diet contains the combinations of foods that provide the proper
   proportions of nutrients
A Healthful Diet Is ____________________________
   ____________________________ refers to eating many different foods from the different food groups on a
   regular basis

Designing a Healthful Diet
Tools for designing a healthful diet include:
________________________ Labels
The __________________ requires food labels on most (but not all) food products. These labels must
include these five components:
1. A statement of identity
2. Net contents of the package
3. Ingredient list
4. Manufacturer's name and address
5. Nutrition information (Nutrition Facts Panel)
Nutrition Facts Panel: Main Functions
   Provide information about an individual food
   _________________ one food with another
Nutrition Facts Panel Information

1. Serving size and servings per container
   Serving sizes are based on the amounts people typically eat for each food

2. Calories and calories from fat per serving
   This information can be used to determine if a product is relatively high in fat

3. List of nutrients
   - Fat (total, saturated, trans)
   - Cholesterol
   - Sodium
   - Fiber
   - Some vitamins and minerals

4. Percent Daily Values (______________)
   How much a serving of food contributes to your overall intake of the listed nutrients
   Compare %DV between foods for nutrients
   - Less than 5% DV of a nutrient is considered low
   - More than 20% DV of a nutrient is considered high

5. Footnote
   %DV is based on a 2,000-calorie diet
   Table illustrates the difference between a 2,000-calorie and 2,500-calorie diet
   May not be present on all food labels

What is the purpose for the food labels?

Nutrient and health ____________________________

Must meet FDA-approved _______________________

Example: "low in sodium" indicates that the particular food contains 140 mg or less of sodium per serving

Structure–function claims

Made without FDA approval, proof, or guarantees that any benefits are true

Example: "Improves memory"

Dietary ____________________________ for Americans

Set of principles developed by U.S. Departments of Agriculture and Health and Human Services

Designed to ____________________________ health, reduce risk of chronic diseases, and reduce prevalence of obesity/overweight

Updated every ___ years

Most recent update was in 2010

2010 Dietary Guidelines

Four Key Recommendations

__________________________ Calories to Maintain ____________________________

Keep nutrient consumption within your ____________________________ needs (no less than you need, and no more).

Key recommendations:

- Control Calorie intake; if overweight, consume fewer Calories
- Increase physical activity levels to lose weight
- Choose ____________________________ foods and beverages; they supply the most nutrients for the least amount of calories
Consume __________ Foods of ______________
Reduce consumption of these foods or food components:

_________ (linked to high blood pressure and calcium loss)
_________ (consume "healthy" fats in moderation; avoid saturated and trans fats)
_________ (contribute significantly to obesity and tooth decay)
_________ (provides no nutrients and can lead to numerous serious conditions if consumed in excess)

Consume More ________________ Foods
Increase intake of ________________ and ________________

Make at least half of your grain foods "______________________________
Choose fat-free or lowfat milk/dairy products
Choose proteins ________________ in solid fats and Calories, such as lean beef, skinless poultry, and seafood
Choose foods that provide ________________ and key nutrients, including potassium, calcium, and vitamin D

Follow Healthy Eating __________________
The guidelines are designed to accommodate diverse cultural, ethnic, and personal preferences via flexible templates such as USDA Food Patterns and various regional diets (to come)
Includes four key food safety principles:

___________ your hands, food surfaces, and foods
___________ raw, cooked, and ready-to-eat foods
___________ foods to a safe temperature (keep hot foods hot)
___________ (refrigerate) perishable foods promptly (keep cold foods cold)
___________: avoid certain unpasteurized, raw, or undercooked foods

USDA Food Patterns: ________________
MyPlate is the visual representation of the USDA Food Patterns
Released in 2011; an interactive, personalized guide (www.choosemyplate.gov)
Based on the 2010 Dietary Guidelines and the Dietary Reference Intakes from the National Academy of Sciences
Replaced the prior MyPyramid graphic and guidelines
Intended to help Americans make better food choices

MyPlate
Key components:

Eat in ________________ to ________________ Calories
Eat a ________________ of foods
Consume the right ________________ of each recommended food group
______________ your eating plan
Increase your __________________________ activity
Set __________________ for gradually improving your food choices and lifestyle

USDA Food Patterns: Food Groups

Five food groups (with corresponding MyPlate colors):

1. ______________________ (orange)
2. ______________________ (green)
3. ______________________ (pink)
4. ______________________ foods (blue)
5. ______________________ foods (purple)

USDA Food Patterns: Grains

"Make __________ your grains whole"
Eat at least 3 ounces of whole-grain breads, cereal, crackers, rice, or pasta each day
Whole-grain foods provide fiber-rich carbohydrates and are good sources of the nutrients riboflavin, thiamin, niacin, iron, folate, zinc, protein, and magnesium

USDA Food Patterns: Vegetables

"__________________ your veggies"
Eat more dark ___________ and _____________ vegetables and more dry beans and peas
Eat at least 2 1/2 cups of vegetables each day
Vegetables provide fiber and phytochemicals, carbohydrates, vitamins A & C, folate, potassium, and magnesium

USDA Food Patterns: Fruits

"______________ on fruits"
Eat a greater variety of fruits
Go easy on fruit juices (they can contribute a lot of sugar and provide little fiber)
Eat at least 1 1/2 cups of fruit each day
Fruits provide fiber, phytochemicals, vitamins A & C, folate, potassium, and magnesium.

USDA Food Patterns: Dairy Foods

"Get your __________________ foods"
Choose lowfat or fat-free dairy products
People who can't consume dairy can choose lower-lactose or lactose-free dairy products or other calcium sources, such as:
Calcium-fortified juices; soy and rice beverages
Get 3 cups of lowfat dairy foods, or their equivalent, each day
Dairy foods provide calcium, phosphorus, riboflavin, protein, vitamin B_{12}, and many are fortified with vitamins A and D

USDA Food Patterns: Protein Foods

"Go ______________ with protein"
Includes meat, poultry, fish, beans, peas, eggs, nuts, seeds, and soy products
Choose lowfat or lean meats and poultry
Switch to baking, broiling, or grilling
Each about 5 1/2 ounces of lean protein foods each day
This food group provides protein, phosphorus, vitamins B_6 and B_{12}, magnesium, iron, zinc, niacin, riboflavin, and thiamin.

USDA Food Patterns: Empty Calories
These are Calories from solid fats and/or added sugars that provide ________ or ______ nutrients.
Limit these to a small number that fits your Calorie and nutrient needs based on your age, gender, and level of physical activity.
Foods with the most empty Calories include:
- cakes, cookies, pastries, & doughnuts
- soft drinks & fruit juices
- cheese, pizza, sausages, hot dogs, bacon, & ribs
- ice cream

USDA Food Patterns: Number & Size of Servings
The number of servings is based on your age, gender, and activity level.

Ounce-equivalent is used to define a serving size that is 1 ounce, or the equivalent of 1 ounce, for the grains and meats/beans groups.
No nationally-standardized definition of a serving size currently exists for any food.
Hence, serving sizes can vary between what's on food labels, served in restaurants, or bought in stores.

USDA Food Patterns: Number & Size of Servings
Other serving-size challenges include:
The trend toward "super-sizing" meals and portions.
Hence, the servings sizes in the USDA Food Patterns are typically smaller than what many people actually eat.

USDA Food Patterns: Serving Sizes
Best approach is to:
- Familiarize yourself with ounce-equivalents
- Use responsible diet-planning tools such as MyPlate
- Learn the definitions of a serving size for the diet tool you use, and then...
- Measure your food intake.

Ethnic Variations of MyPyramid
Variations of MyPyramid still exist for various ethnic diets, including:
- Latin American Diet Pyramid
- Asian Diet Pyramid
- Mediterranean Diet Pyramid
- Native Americans, African Americans, and other groups
These variations show that healthful alternatives exist for different food preferences and traditions.

Eating Out on a Healthful Diet
Eating in restaurants often involves:
- ______________-calorie, ______________-fat, & ______________-sodium foods
- ______________ portion sizes

About 75% of consumers eat out at least once a week.
Research shows a positive association between the number of restaurants per person in a given geographic area, and local obesity rates.
A single restaurant or fast-food meal can be equivalent to the recommended fat or Calorie intake for an entire day!
It is possible to dine out healthfully
Follow these guidelines when eating out:
  • Opt for lower-fat and lower-Calorie menu items
  • Avoid all-you-can-eat buffets or offers
  • Avoid appetizers, or at least those that are breaded, fried, or filled with cheese or meat
  • Order your meal from the children's menu
  • Order broth-based rather than cream-based soups
More guidelines for eating out healthfully:
  • Select lean cuts of meat that are not fried
  • Order meatless dishes
  • Choose a side salad with low- or nonfat dressing
  • Order vegetables on the side instead of starches
  • Order low- or no-Calorie beverages
  • Avoid coffees with syrups or heavy creams
Don't eat everything served; take some food home.