

An Overview of Nutrition



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Nutrition in Your Life

- Nutrition
 - The science of foods and the substances they contain

Nutrition in Your Life

- Food
 - Derived from plant or animal sources
 - Provide energy and nutrients
 - Used by the body for maintenance, growth, and repair

Nutrition in Your Life

- Diet
 - The foods one consumes
 - The quality of which affects the risk of chronic diseases

Food Choices

- Personal preference
- Habit
- Ethnic heritage or tradition
- Social interactions
- Availability, convenience, economy

Food Choices

- Positive and negative associations
- Emotional comfort
- Values
- Body weight and image

Food Choices

- Nutrition and health benefits
 - Functional foods
 - Provide health benefits beyond their nutrient contributions
 - Ex. Whole foods, fortified foods

The Nutrients

- Energy defined
- Nutrient defined

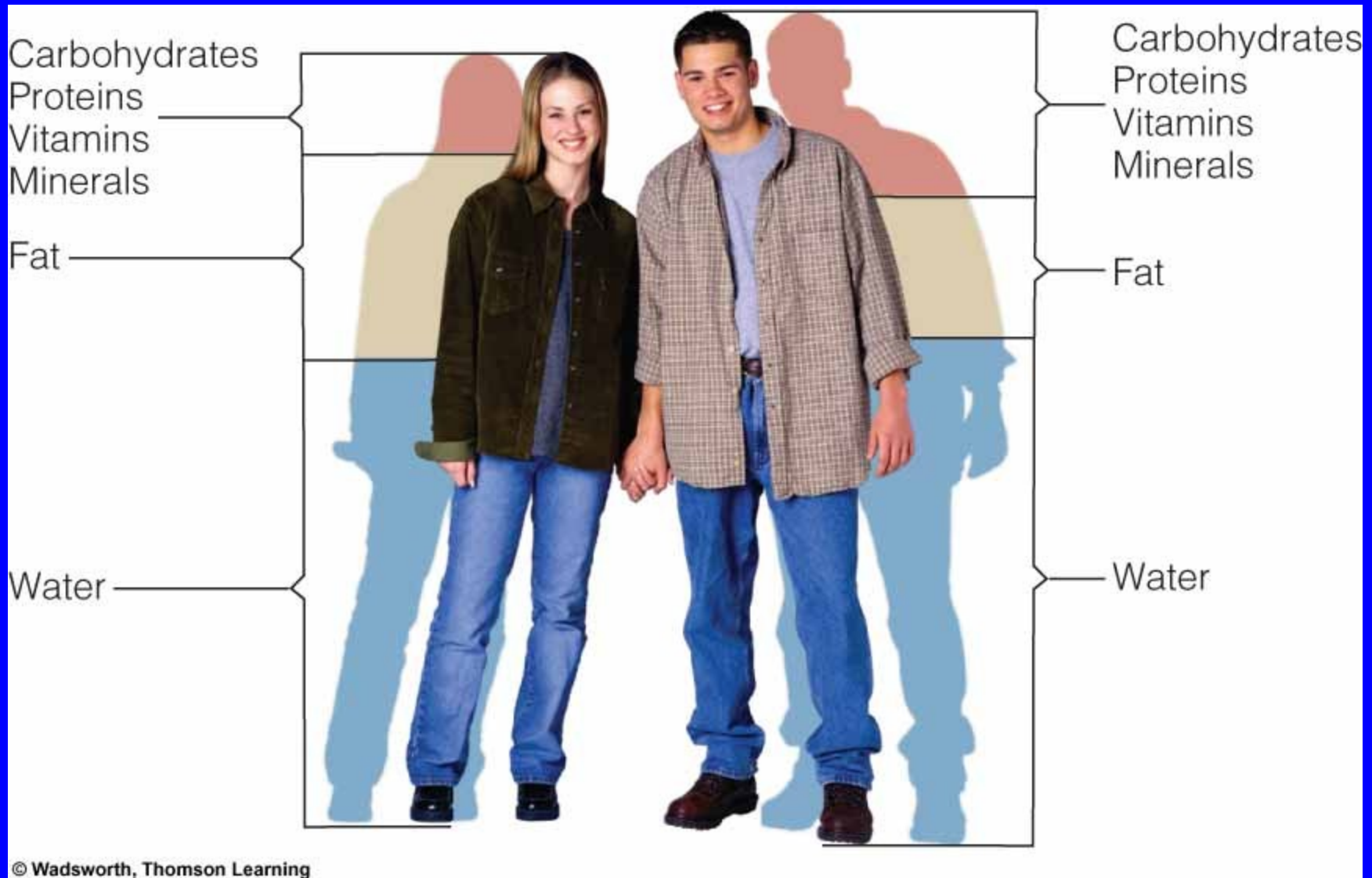


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The Nutrients

- Composition of foods
 - Six classes of nutrients
 - Nonnutrients

Body Composition



The Nutrients

- Chemical composition of nutrients
 - Inorganic vs. Organic nutrients

The Nutrients

- Inorganic nutrients
 - Minerals
 - Water

The Nutrients

- Organic nutrients
 - Carbohydrates
 - Lipids
 - Proteins
 - Vitamins

The Nutrients

TABLE 1-1

Elements in the Six Classes of Nutrients

Notice that organic nutrients contain carbon.

	Carbon	Hydrogen	Oxygen	Nitrogen	Minerals
Inorganic nutrients					
Minerals					✓
Water		✓	✓		
Organic nutrients					
Carbohydrates	✓	✓	✓		
Lipids (fats)	✓	✓	✓		
Proteins ^a	✓	✓	✓	✓	
Vitamins ^b	✓	✓	✓		

^aSome proteins also contain the mineral sulfur.

^bSome vitamins contain nitrogen; some contain minerals.

The Nutrients

- Essential nutrients
- Macronutrients vs. micronutrients

Energy-Yielding Nutrients

- Calories and kilocalories

TABLE 1-2

kCalorie Values

of Energy Nutrients

Energy Nutrients	kCalories ^a (per gram)
Carbohydrate	4 kcal/g
Fat	9 kcal/g
Protein	4 kcal/g

NOTE: Alcohol contributes 7 kcalories per gram that can be used for energy, but it is not considered a nutrient because it interferes with the body's growth, maintenance, and repair.

^aFor those using kilojoules: 1 g carbohydrate = 17 kJ; 1 g protein = 17 kJ; 1 g fat = 37 kJ; and 1 g alcohol = 29 kJ.

Energy-Yielding Nutrients

- Energy from foods
 - Energy density

Energy Density

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LOWER ENERGY DENSITY

This 450-gram breakfast delivers 500 kcalories, for an energy density of 1.1 ($500 \text{ kcal} \div 450 \text{ g} = 1.1 \text{ kcal/g}$).



HIGHER ENERGY DENSITY

This 144-gram breakfast also delivers 500 kcalories, for an energy density of 3.5 ($500 \text{ kcal} \div 144 \text{ g} = 3.5 \text{ kcal/g}$).

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Energy-Yielding Nutrients

- Energy in the body
 - Energy for activity
 - Stored energy
- Other roles of energy-yielding nutrients

Vitamins

- Organic
- Not energy-yielding
- Essential
- Water-soluble vs. fat-soluble
- Vulnerable to destruction

Minerals

- Inorganic
- Not energy-yielding
- Essential
- Indestructible

Water

- Inorganic
- Not energy-yielding
- Essential

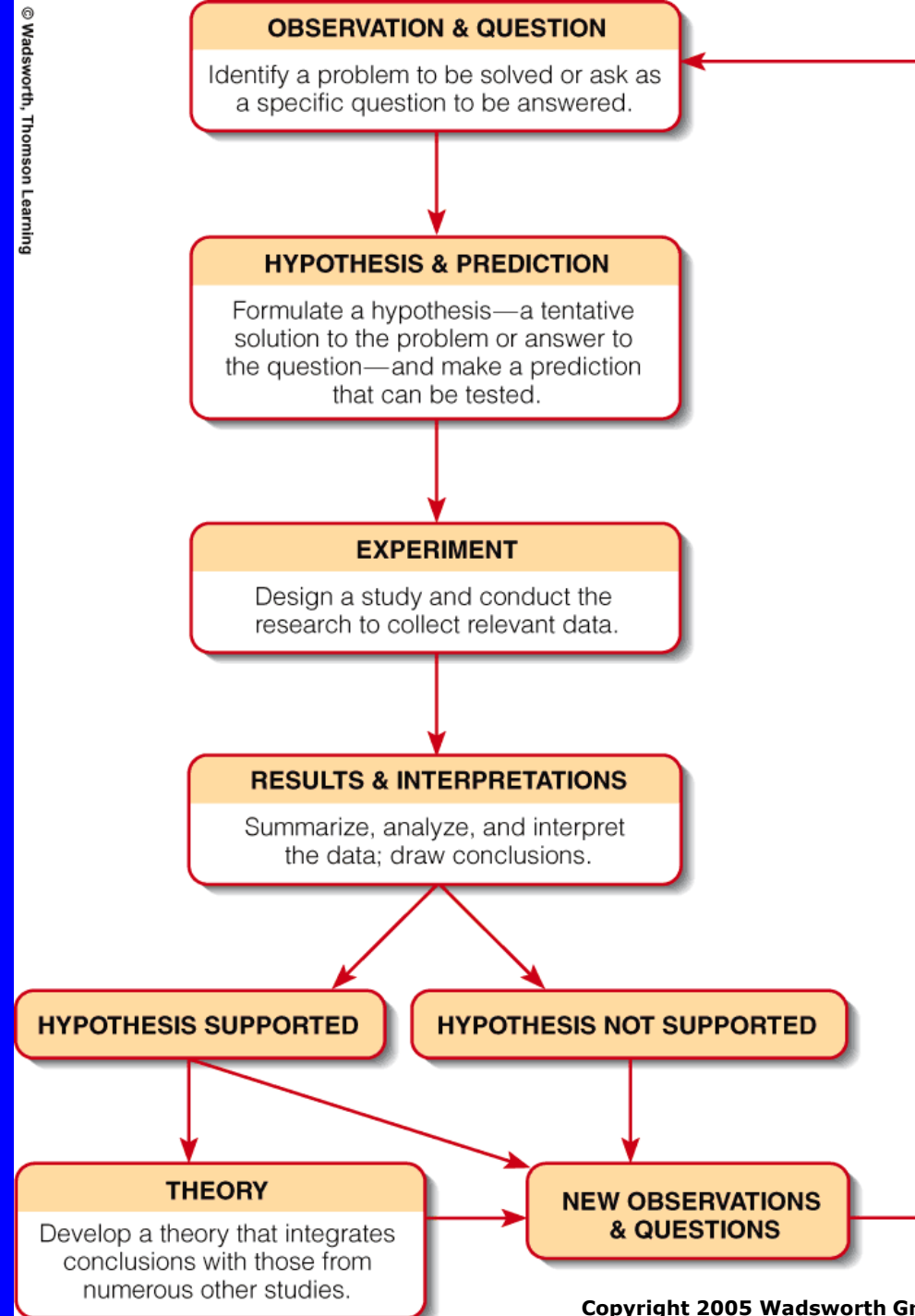


The Science of Nutrition

- Human genome
- Nutritional genomics

Nutrition Research

- The Scientific Method
 - Hypothesis vs. Theory
 - Experimental group vs. control group
 - Randomization
 - Sample size



Nutrition Research

- The Scientific Method
 - Epidemiological studies
 - Laboratory-based studies
 - Human intervention or clinical trials

Nutrition Research

EPIDEMIOLOGICAL STUDIES

CROSS-SECTIONAL



Researchers observe how much and what kinds of foods a group of people eat and how healthy those people are. Their findings identify factors that might influence the incidence of a disease in various populations.

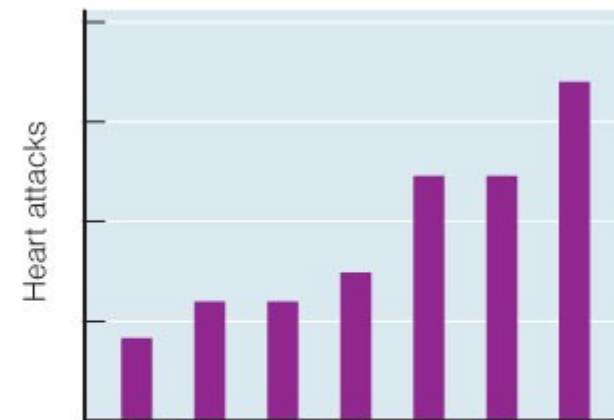
Example. The people of the Mediterranean region drink lots of wine, eat plenty of fat from olive oil, and have a lower incidence of heart disease than northern Europeans and North Americans.

CASE-CONTROL

Researchers compare people who do and do not have a given condition such as a disease, closely matching them in age, gender, and other key variables so that differences in other factors will stand out. These differences may account for the condition in the group that has it.

Example. People with goiter lack iodine in their diets.

COHORT



Researchers analyze data collected from a selected group of people (a cohort) at intervals over a certain period of time.

Example. Data collected periodically over the past several decades from over 5000 people randomly selected from the town of Framingham, Massachusetts, in 1948 have revealed that the risk of heart attack increases as blood cholesterol increases.

Nutrition Research

EXPERIMENTAL STUDIES

LABORATORY-BASED ANIMAL STUDIES

LABORATORY-BASED IN VITRO STUDIES

HUMAN INTERVENTION (OR CLINICAL) TRIALS



USDA Agricultural Research Service



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Researchers feed animals special diets that provide or omit specific nutrients and then observe any changes in health. Such studies test possible disease causes and treatments in a laboratory where all conditions can be controlled.

Example. Mice fed a high-fat diet eat less food than mice given a lower-fat diet, so they receive the same number of kcalories—but the mice eating the fat-rich diet become severely obese.

Researchers examine the effects of a specific variable on a tissue, cell, or molecule isolated from a living organism.

Example. Laboratory studies find that fish oils inhibit the growth and activity of the bacteria implicated in ulcer formation.

Researchers ask people to adopt a new behavior (for example, eat a citrus fruit, take a vitamin C supplement, or exercise daily). These trials help determine the effectiveness of such interventions on the development or prevention of disease.

Example. Heart disease risk factors improve when men receive fresh-squeezed orange juice daily for two months compared with those on a diet low in vitamin C—even when both groups follow a diet high in saturated fat.

TABLE 1-3**Strengths and Weaknesses of Research Designs**

Type of Research	Strengths	Weaknesses
Epidemiological studies determine the incidence and distribution of diseases in a population. Epidemiological studies include cross-sectional, case-control, and cohort (see Figure 1-4).	<ul style="list-style-type: none">• Can narrow down the list of possible causes• Can raise questions to pursue through other types of studies	<ul style="list-style-type: none">• Cannot control variables that may influence the development or the prevention of a disease• Cannot prove cause and effect
Laboratory-based studies explore the effects of a specific variable on a tissue, cell, or molecule. Laboratory-based studies are often conducted in test tubes (in vitro) or on animals.	<ul style="list-style-type: none">• Can control conditions• Can determine effects of a variable	<ul style="list-style-type: none">• Cannot apply results from test tubes or animals to human beings
Human intervention or clinical trials involve human beings who follow a specified regimen.	<ul style="list-style-type: none">• Can control conditions (for the most part)• Can apply findings to some groups of human beings	<ul style="list-style-type: none">• Cannot generalize findings to all human beings• Cannot use certain treatments for clinical or ethical reasons

Nutrition Research

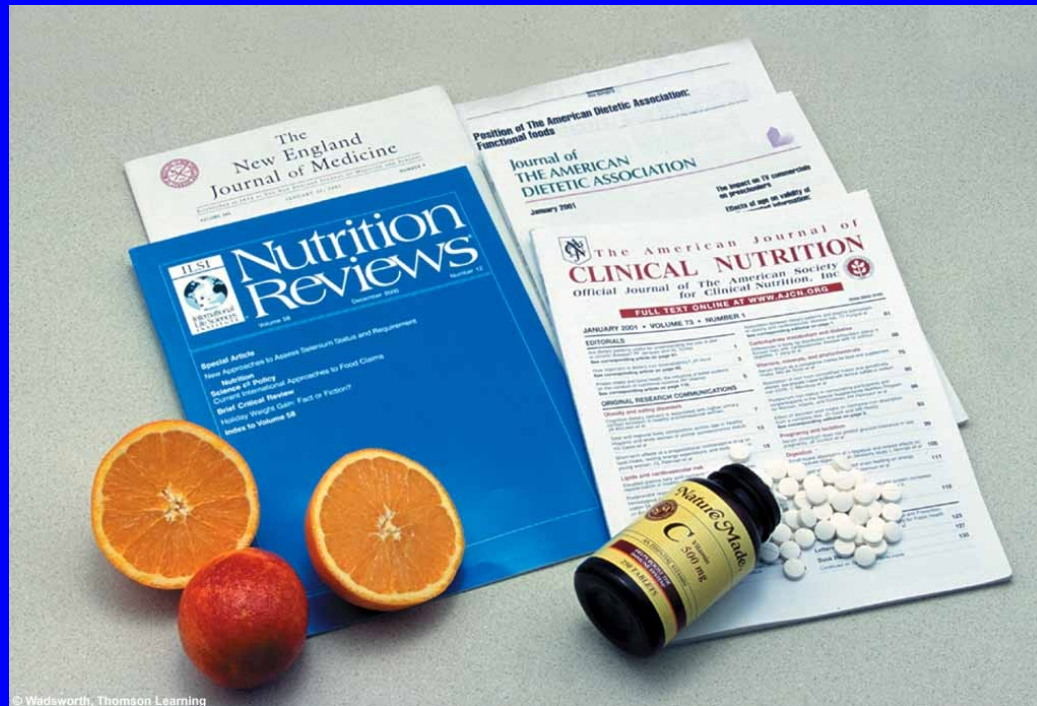
- The Scientific Method
 - Placebo effect
 - Blind experiment
 - Double-blind experiment

Nutrition Research

- The Scientific Method
 - Correlations and causes
 - Positive correlation vs. negative correlation
 - Replication
 - Peer review

Nutrition Research

- Research Vs. Rumors
 - Scientific validity



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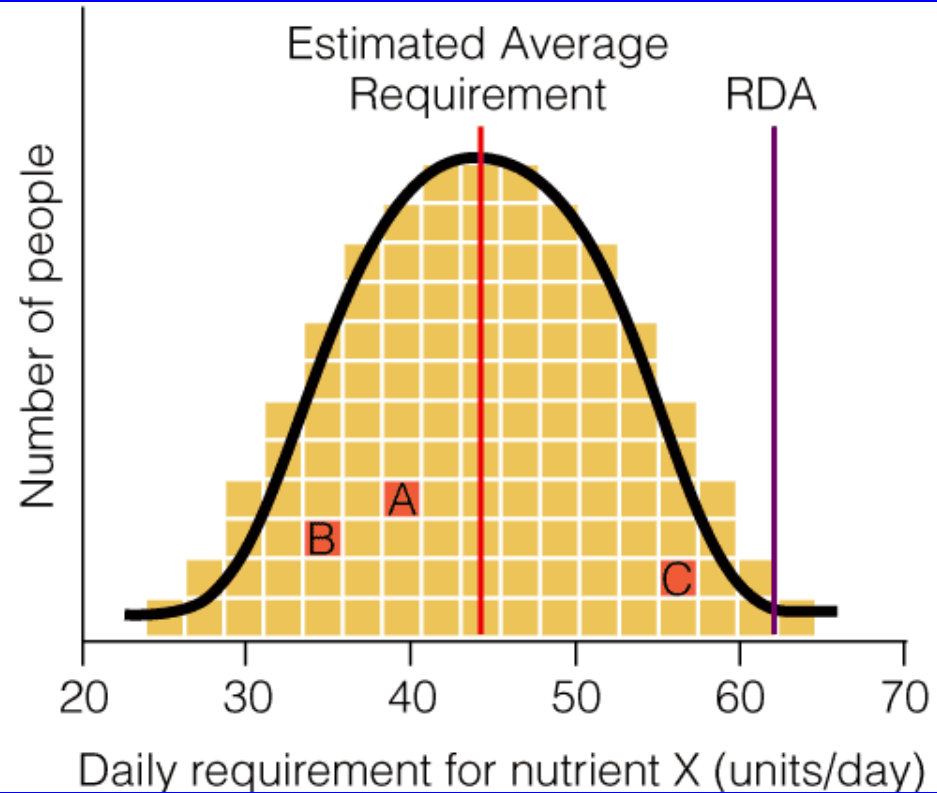
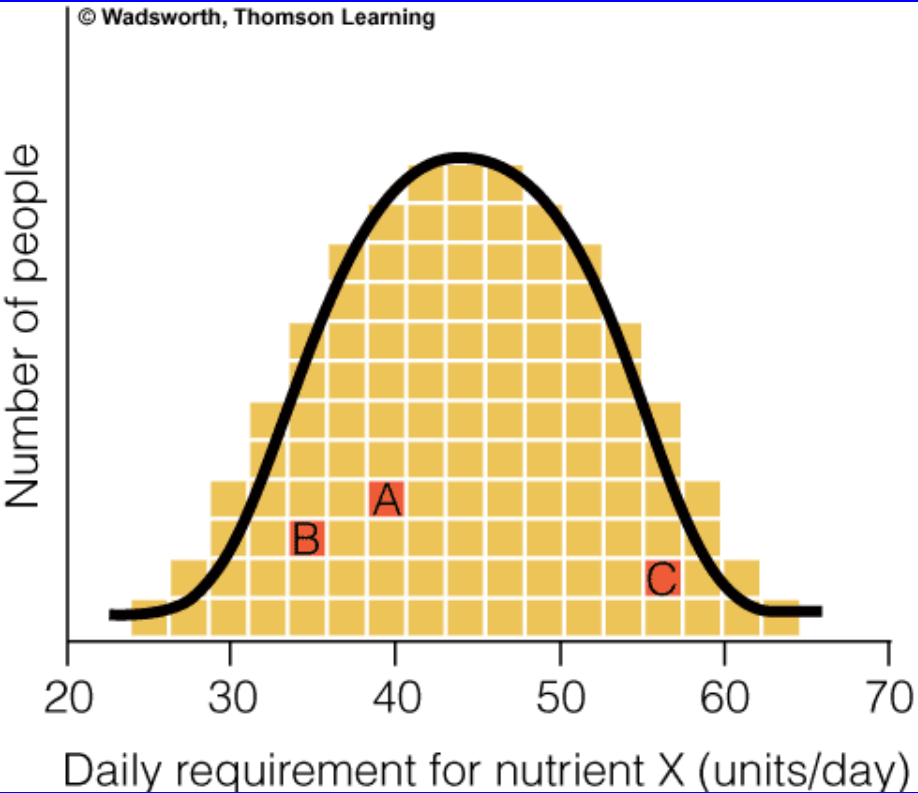
Dietary Reference Intakes

- Estimated Average Requirements
- Recommended Dietary Allowances
- Adequate Intakes
- Tolerable Upper Limits

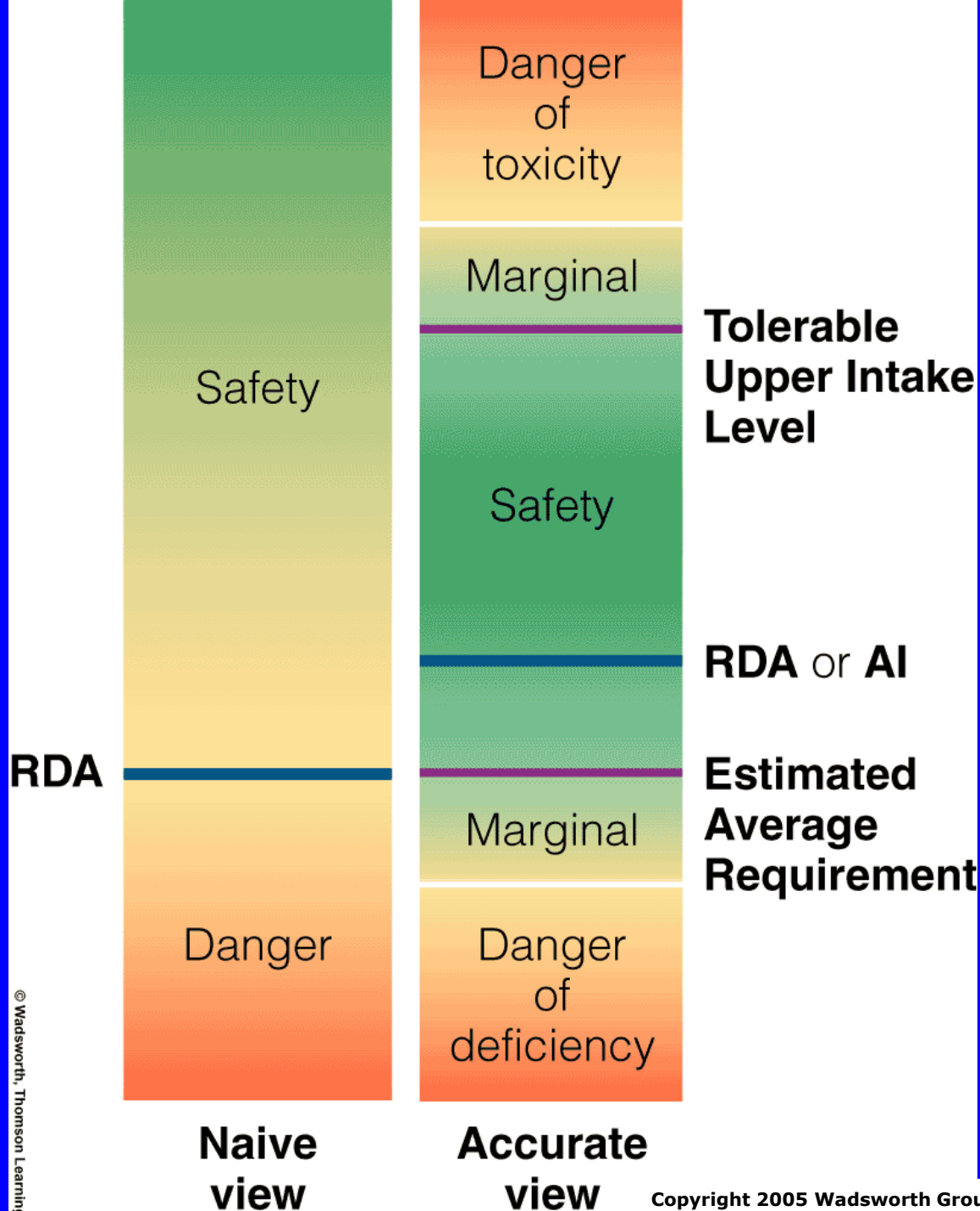


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DRI



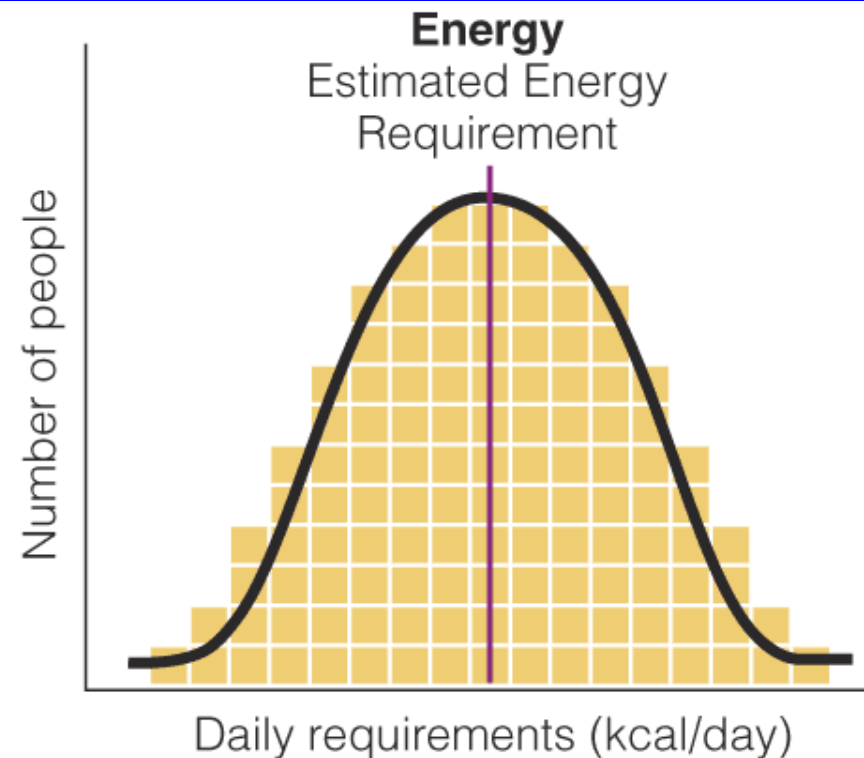
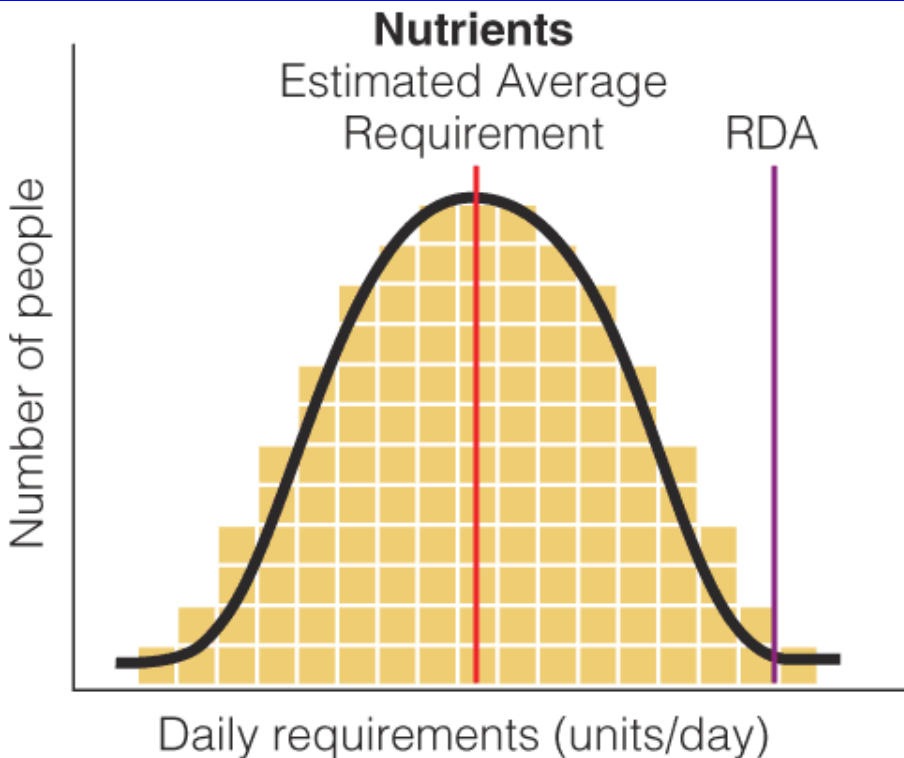
DRI



Energy Recommendations

- Estimated Energy Requirement
- Acceptable Macronutrient Distribution Ranges
 - Carbohydrate: 45% - 65%
 - Fat: 20% - 35%
 - Protein: 10% - 35%

Energy Recommendations



Using Nutrient Recommendations

- Estimates of energy & nutrient intakes apply to healthy people
- Recommendations are NOT minimum requirements
- Recommendations are NOT optimal for all people

Using Nutrient Recommendations

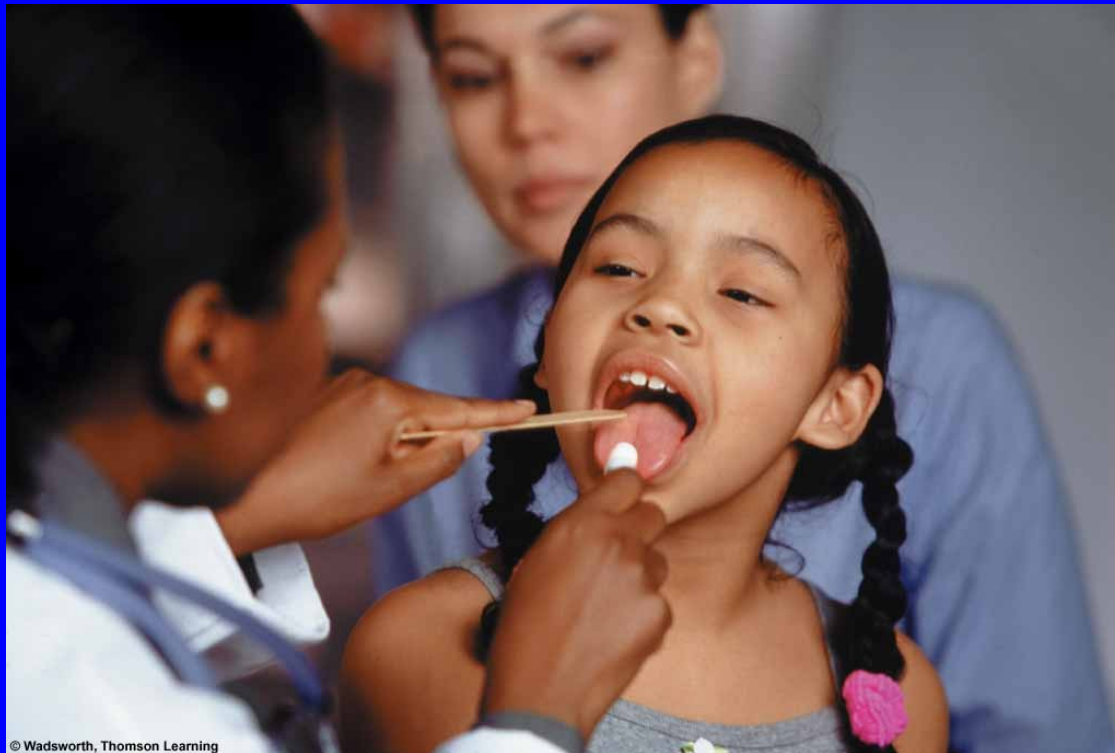
- Recommendations should be met by consuming a varied diet
- Recommendations apply to average daily intakes
- Each DRI category serves a unique purpose

Comparing Nutrient Recommendations

- U.S. & Canada: DRI Committee
- International: FAO and WHO

Nutrition Assessment

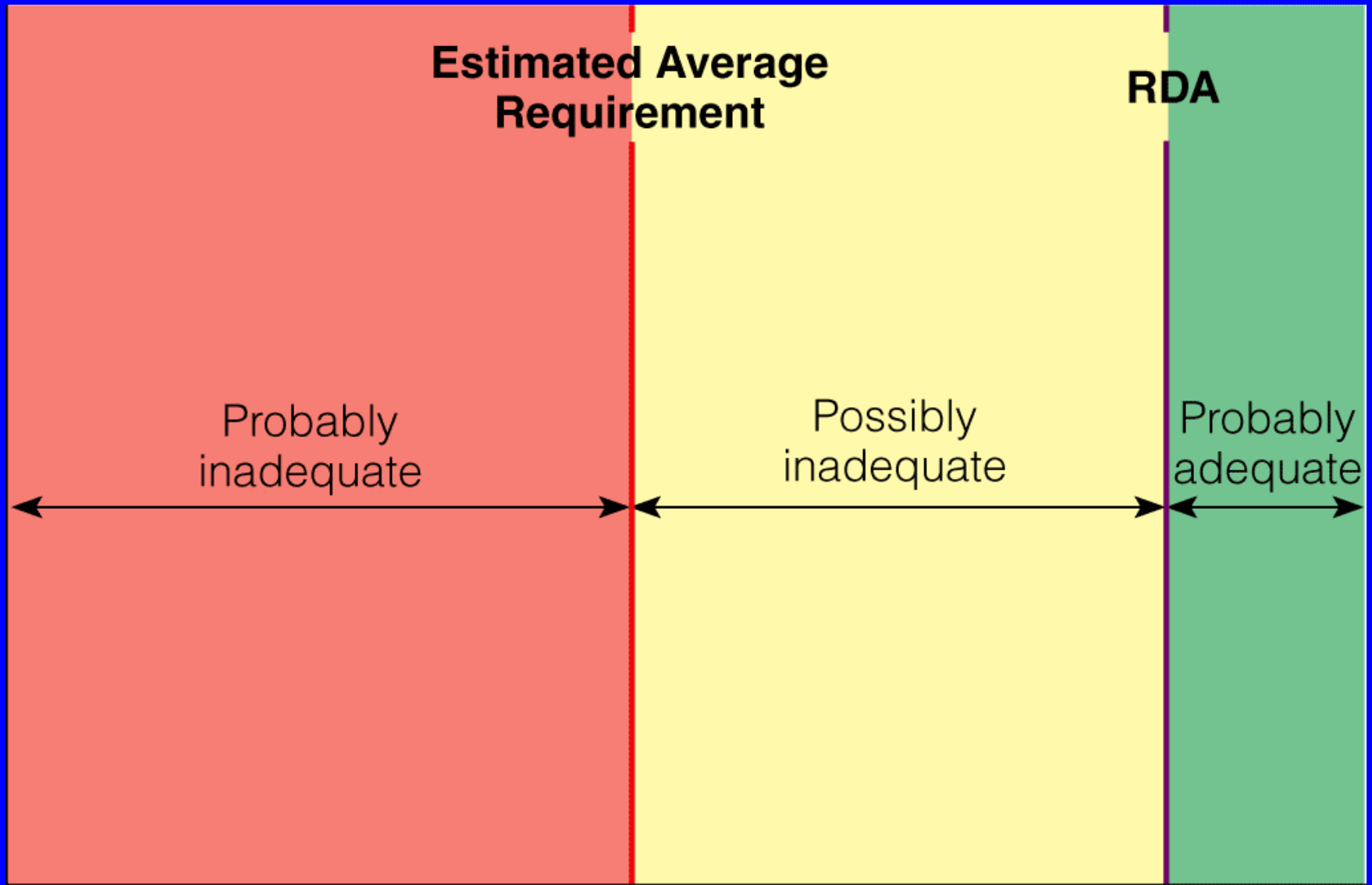
- Malnutrition
 - Undernutrition vs. overnutrition



Nutrition Assessment of Individuals

- Historical information
- Anthropometric data
- Physical examination
- Laboratory tests

Nutrition Assessment



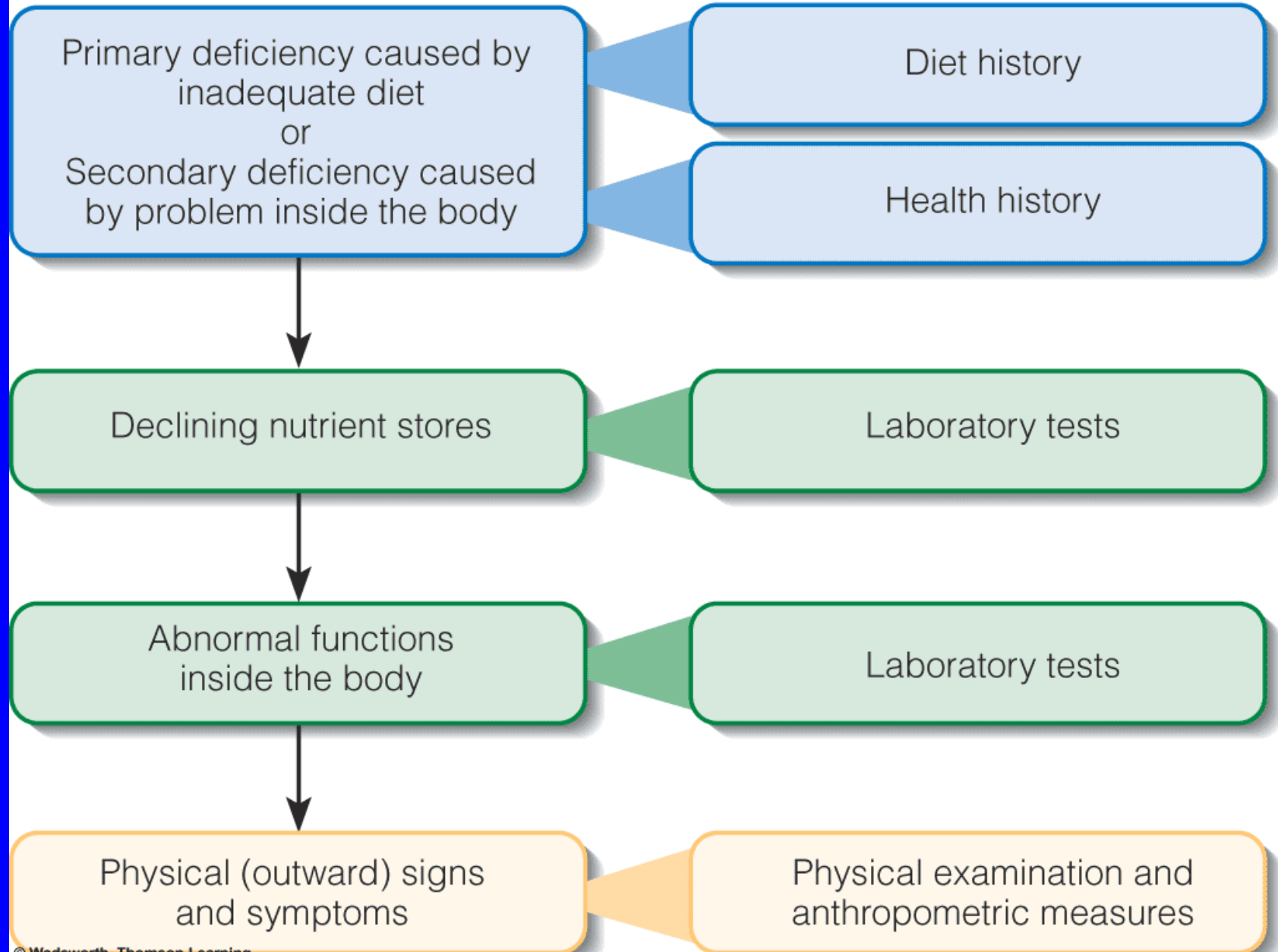
Usual intake of nutrient X (units/day)

Nutrition Assessment of Individuals

- Primary deficiency vs. secondary deficiency
- Overt symptoms
- Subclinical deficiency
 - Covert symptoms

WHAT HAPPENS IN THE BODY

WHICH ASSESSMENT METHODS REVEAL CHANGES



Nutrition Assessment of Populations

- National nutrition surveys
- National health goals
 - Healthy People 2000
 - Healthy People 2010

Nutrition Assessment of Populations

TABLE 1-4 Healthy People 2010 Nutrition and Overweight Objectives

HEALTHY
PEOPLE
2010

- Increase the proportion of adults who are at a *healthy weight*.
- Reduce the proportion of adults who are *obese*.
- Reduce the proportion of children and adolescents who are *overweight* or *obese*.
- Reduce *growth retardation* among low-income children under age 5 years.
- Increase the proportion of persons aged 2 years and older who consume at least two daily servings of *fruit*.
- Increase the proportion of persons aged 2 years and older who meet dietary recommendations for *calcium*.
- Reduce *iron deficiency* among young children, females of childbearing age, and pregnant females.
- Reduce *anemia* among low-income pregnant females in their third trimester.
- Increase the proportion of children and adolescents aged 6 to 19 years whose intake of *meals and snacks at school* contributes to good overall dietary quality.

- Increase the proportion of persons aged 2 years and older who consume at least three daily servings of *vegetables*, with at least one-third being dark green or orange vegetables.
- Increase the proportion of persons aged 2 years and older who consume at least six daily servings of *grain products*, with at least three being whole grains.
- Increase the proportion of persons aged 2 years and older who consume less than 10 percent of kcalories from *saturated fat*.
- Increase the proportion of persons aged 2 years and older who consume no more than 30 percent of kcalories from *total fat*.
- Increase the proportion of persons aged 2 years and older who consume 2400 mg or less of *sodium*.

- Increase the proportion of schools that teach all essential *nutrition education* topics in one course.
- Increase the proportion of worksites that offer *nutrition or weight management classes or counseling*.
- Increase the proportion of primary care providers who provide *nutrition assessment* when appropriate and who formulate a diet plan for those who need *intervention*.
- Increase the proportion of physician office visits made by patients with a diagnosis of cardiovascular disease, diabetes, or hyperlipidemia that include *counseling or education related to diet and nutrition*.
- Increase *food security* among U.S. households and in so doing reduce hunger.

NOTE: "Nutrition and Overweight" is one of 28 focus areas, each with numerous objectives. Several of the other focus areas have nutrition-related objectives, and these are presented in later chapters.

SOURCE: Healthy People 2010, www.healthypeople.gov

Diet and Health

TABLE 1-5 Leading Causes of Death in the United States

	Percentage of Total Deaths
1. Heart disease	28.9
2. Cancers	22.9
3. Strokes	6.8
4. Chronic lung diseases	5.1
5. Accidents	4.0
6. Diabetes mellitus	2.9
7. Pneumonia and influenza	2.6
8. Alzheimer's disease	2.2
9. Kidney diseases	1.6
10. Blood infections	1.3

NOTE: The diseases highlighted in green have relationships with diet; yellow indicates a relationship with alcohol.

Diet and Health

TABLE 1-6 Factors Contributing to Deaths in the United States

Factors	Percentage of Deaths
Tobacco	20
Poor diet/inactivity	14
Alcohol	6
Microbial agents	4
Pollutants/toxins	3
Firearms	2
Sexual behavior	1
Motor vehicles	1
Illicit drugs	1

SOURCE: Centers for Disease Control, www.cdc.gov.

Risk Factors for Chronic Diseases

- Risk factors persists
- Risk factors cluster
- Risk factors in perspective



Nutrition Information and Misinformation

- Not everything on the Internet is true!!
 - Determination of the reliability of a website
- Not everything on the news is accurately reported!!

Nutrition Information and Misinformation

- American Dietetic Association (ADA)
- Registered dietitian (RD)
- Dietetic technician, registered (DTR)



TABLE H1-1

Responsibilities of a Clinical Dietitian

- Assesses clients' nutrition status.
- Determines clients' nutrient requirements.
- Monitors clients' nutrient intakes.
- Develops, implements, and evaluates clients' nutrition care plans.
- Counsels clients to cope with unique diet plans.
- Teaches clients and their families about nutrition needs and diet plans.
- Provides training for other dietitians, nurses, interns, and dietetics students.
- Serves as liaison between clients and the foodservice department.
- Communicates with physicians, nurses, pharmacists, and other health care professionals about clients' progress, needs, and treatments.
- Participates in professional activities to enhance knowledge and skill.

Nutrition Information and Misinformation

- Finding credible information
 - Government health agencies
 - Volunteer health agencies
 - reputable consumer groups
 - Reputable consumer groups

Nutrition Information and Misinformation

- Finding credible information
 - Professional health organizations
 - Professional journals

REVIEWS

Articles that examine all the major work on a subject are published in review journals like *Nutrition Reviews*. These articles provide references to all of the original work reviewed.

Nutrition Reviews
Volume 61 June 2003 Number 6 (Part 2)

Lead Review Article
Isoflavone Effects on Cholesterol

Special Article
Biotin Isoflavones in Functional Foods

Brief Critical Reviews
Lactose Intolerance and Osteoporosis

Artificial Sweetener and Body Weight

Immunonutrition

A Publication of the International Life Sciences Institute

ISSN 0029-4529 and for the NISIRAS 0029-120X Printed on acid-free paper

INDEXES

Indexes provide a listing of research articles on a given subject. Several online indexes are available, but one of the best for nutrition research is PubMed, a service of the National Library of Medicine. For free access, visit www.pubmed.gov

NCBI PubMed National Library of Medicine

Search:

1-10 of 10 items

1. **Percent body fat in the common cold: a double-blind, placebo-controlled survey.**
Toussaint H, Lohr G, Savelbergh G, et al. *Journal of Sports Sciences*. 2003;21(12):1331-40. PMID: 12715766 (PubMed) (Indexed for MEDLINE)

2. **Megadose vitamin C in treatment of the common cold: a randomized controlled trial.**
Majumdar S, et al. *Journal of Family Practice*. 2003;52(10):1045-50. PMID: 15446202 (PubMed) (Indexed for MEDLINE)

3. **Tobacco use, vitamin C, and risk of respiratory infection: a cohort study.**
Kawachi I, et al. *Journal of Epidemiology and Community Health*. 2003;57(11):848-53. PMID: 12855834 (PubMed) (Indexed for MEDLINE)

4. **Effect of vitamin C on the common cold: a meta-analysis.**
Cohen J, et al. *Journal of Family Practice*. 2003;52(10):1045-50. PMID: 15446202 (PubMed) (Indexed for MEDLINE)

5. **On the prevention of the common cold: do we need more vitamin C?**
Cohen J, et al. *Journal of Family Practice*. 2003;52(10):1045-50. PMID: 15446202 (PubMed) (Indexed for MEDLINE)

6. **Megadose vitamin C in treatment of the common cold: a randomized controlled trial.**
Majumdar S, et al. *Journal of Family Practice*. 2003;52(10):1045-50. PMID: 15446202 (PubMed) (Indexed for MEDLINE)

7. **Vitamin C for preventing and treating the common cold.**
Cochrane Database Syst Rev. 2003;(2):CD002982. Review. PMID: 12746208 (PubMed) (Indexed for MEDLINE)

8. **Review.**
Vitamin C supplementation and common cold symptoms: factors affecting the magnitude of the benefit. *Medical Research*. 2003;32(1):1-6. Review. PMID: 12746208 (PubMed) (Indexed for MEDLINE)

The American Journal of CLINICAL NUTRITION
Official Journal of The American Society for Clinical Nutrition, Inc.

JULY 2003 • VOLUME 78 • NUMBER 1 WWW.AJCN.ORG ISSN 0002-9165

EDITORIALS
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Supplementation and vitamin B-12 status in elderly. AC Arber. See corresponding article on page 121. 3

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Effects of weaning cereals with different glycolide contents on hemoglobin, iron stores, and serum ferritin: a randomized intervention in infants from 6 to 12 mo of age. F Lind et al. 168

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Child iron, zinc, and calcium status and pubertal growth. RJ Strassburg-Staub et al. 176

ADG and other weaning syndromes
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JOURNALS

Articles that present all the details of the methods, results, and conclusions of a particular study are published in journals like the *American Journal of Clinical Nutrition*.

WEBSITES

Websites on the Internet developed by credible sources, such as those listed on p. 34, can provide valuable nutrition information and direct users to other resources. A quick link to many of these nutrition resources is available when you visit www.wadsworth.com/nutrition

Wadsworth Nutrition

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Nutrition / Exercise & Health Maintenance
Public Health Nutrition
Food Protection / Introduction to Food Science & Technology

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TABLE H1-2

Parts of a Research Article

- *Abstract.* The abstract provides a brief overview of the article.
- *Introduction.* The introduction clearly states the purpose of the current study by proposing a hypothesis.
- *Review of literature.* A comprehensive review of the literature reveals all that science has uncovered on the subject to date.
- *Methodology.* The methodology section defines key terms and describes the instruments and procedures used in conducting the study.
- *Results.* The results report the findings and may include tables and figures that summarize the information.
- *Conclusions.* The conclusions drawn are those supported by the data and reflect the original purpose as stated in the introduction. Usually, they answer a few questions and raise several more.
- *References.* The references reflect the investigator's knowledge of the subject and should include an extensive list of relevant studies (including key studies several years old as well as current ones).

Nutrition Information and Misinformation

- Identifying misinformation

Satisfaction guaranteed

Marketers may make generous promises, but consumers won't be able to collect on them.

One product does it all

No one product can possibly treat such a diverse array of conditions.

Time tested

Such findings would be widely publicized and accepted by health professionals.

Paranoid accusations

And this product's company doesn't want money? At least the drug company has scientific research proving the safety and effectiveness of its products.

Quick and easy fixes

Even proven treatments take time to be effective.



Personal testimonials

Hearsay is the weakest form of evidence.

Meaningless medical jargon

Phony terms hide the lack of scientific proof.

Natural

Natural is not necessarily better or safer; any product that is strong enough to be effective is strong enough to cause side effects.

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