



# DIETARY REFERENCE INTAKE

PHAR-432

LECTURE: 2

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Spring Semester (2025-2026)

# Outlines

- Dietary reference intake
- Estimated average requirement (EAR)
- Recommended dietary allowance (RDA)
- Adequate intake (AI)
- Tolerable upper intake level (UL)
- The USDA food patterns
- Nutrition fact panel
- Nutrition assessment



# Dietary Reference Intakes (DRI)

- Quantitative estimates of the amounts of nutrients required to prevent deficiencies and maintain optimal health and growth.



- An example for DRI is calcium



## CALCIUM - Dietary Reference Intakes

AGE/GENDER	RECOMMENDED DAILY ALLOWANCE <small>www.realgoodeats.com</small>
Males 19-70 y	1000 mg/d
Males 71+ y	1200 mg/d
Females 19-50 y	1000 mg/d
Females 51+ y	1200mg/d

# Dietary Reference Intakes (DRI)

The DRI consist of four dietary reference standards for the intake of nutrients designated for specific age groups, gender, and physiologic states (such as pregnancy and lactation in women).

1. **Estimated Average Requirement (EAR)**
2. **Recommended Dietary Allowance (RDA)**
3. **Adequate Intake (AI)**
4. **Tolerable Upper Intake Level (UL)**

# Estimated Average Requirement (EAR):

The EAR is the average daily nutrient intake level estimated to meet the requirement of one half of the healthy individuals in a particular life stage and gender group.

It is useful in estimating the actual requirements in groups and individuals.

EAR is mainly used for:

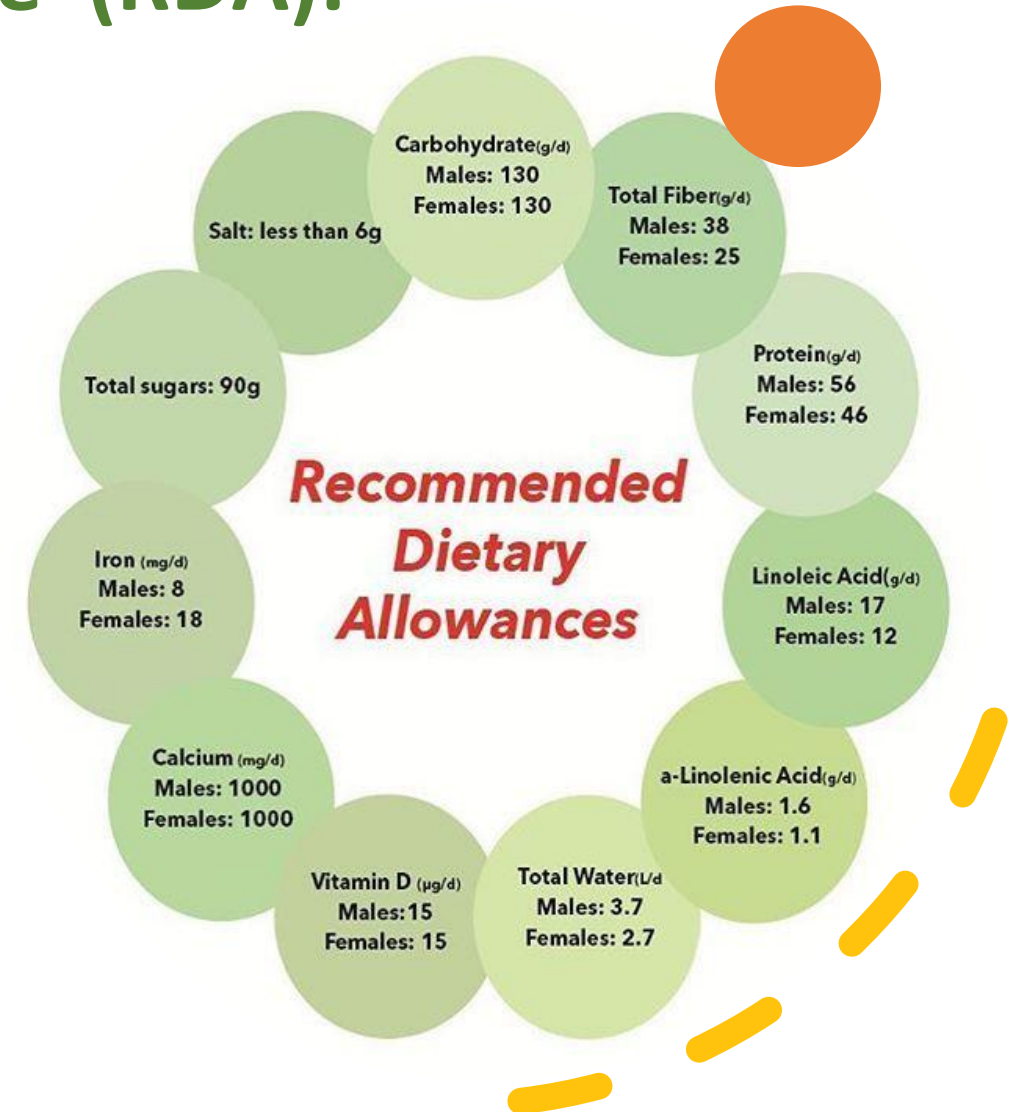
- 1. Assessing nutrient adequacy of populations**
- 2. Developing other dietary standards**
- 3. Planning nutrition programs**
- 4. Research and public health nutrition**

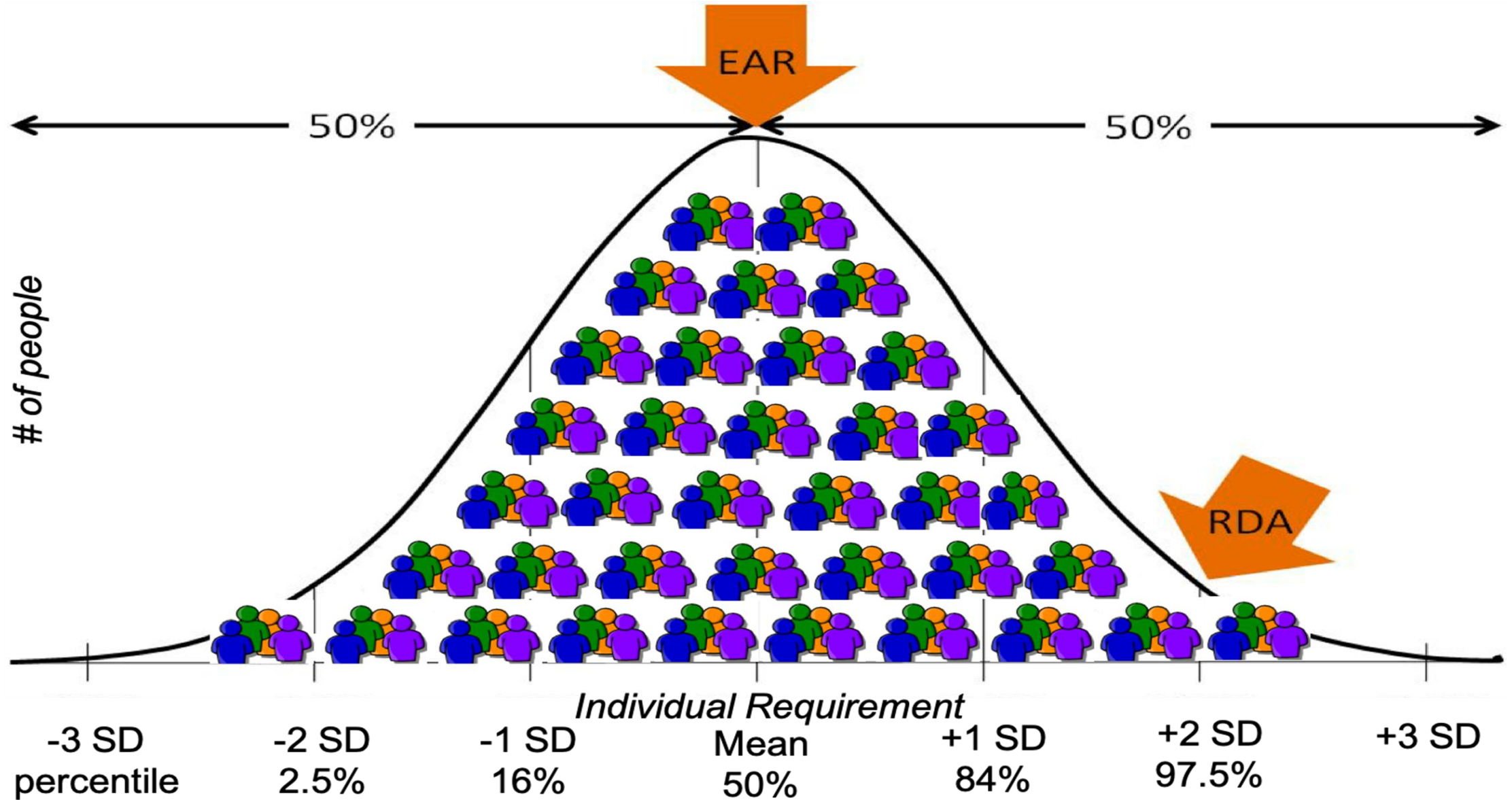


# Recommended Dietary Allowance (RDA):

The RDA is the average daily dietary intake level that is sufficient to meet the nutrient requirements of nearly all (97–98%) the individuals in a life stage and gender group.

- ✓ RDA is two SD above EAR
- ✓  $RDA = EAR + 2 SD$





## Adequate Intake (AI):

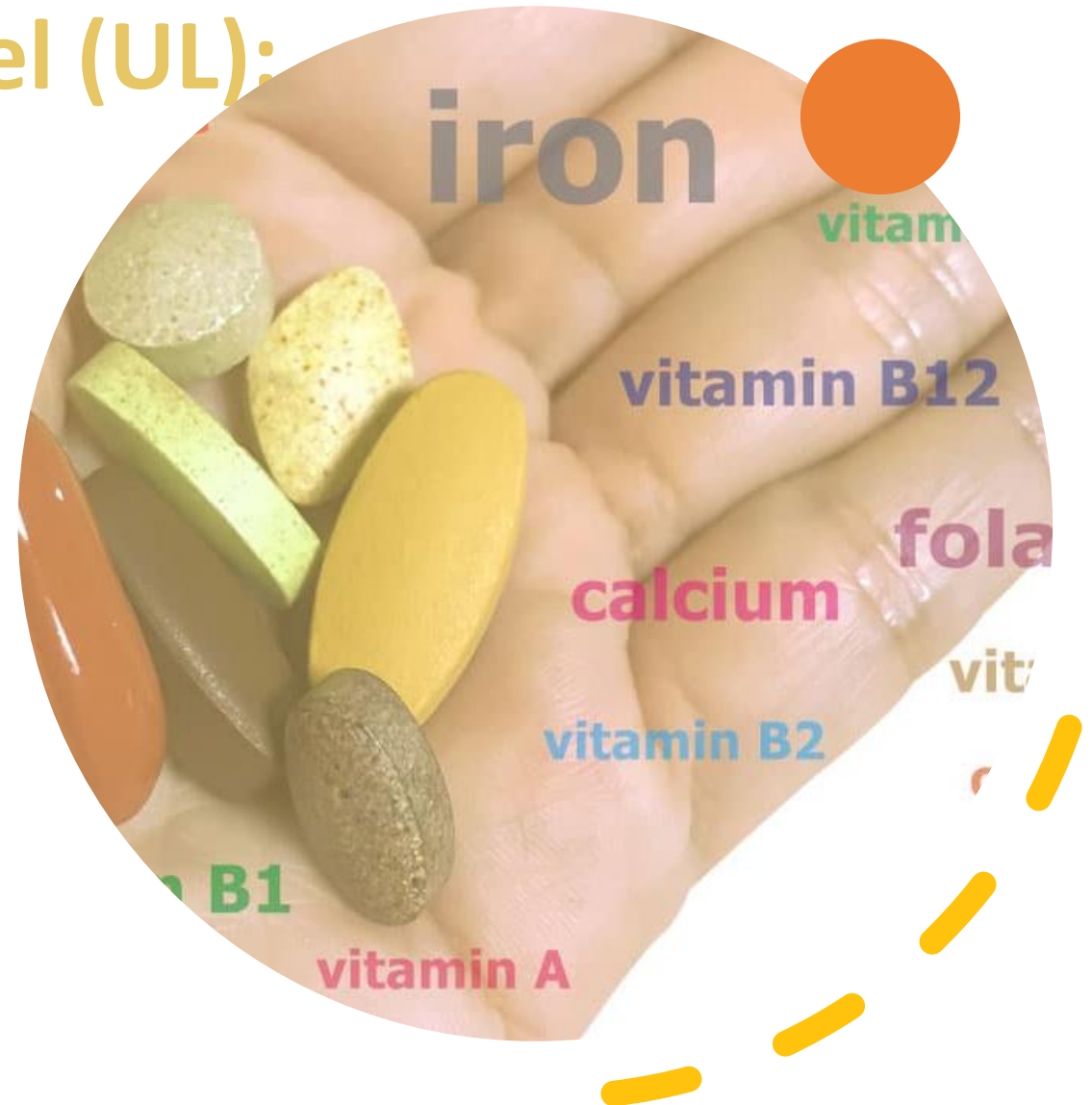
- It is used instead of EAR and RDA if:
- A nutrient is considered essential but the experimental data are inadequate for determining EAR and RDA
- AI covers the nutritional requirement of all individuals in a group with approximation due to insufficient data



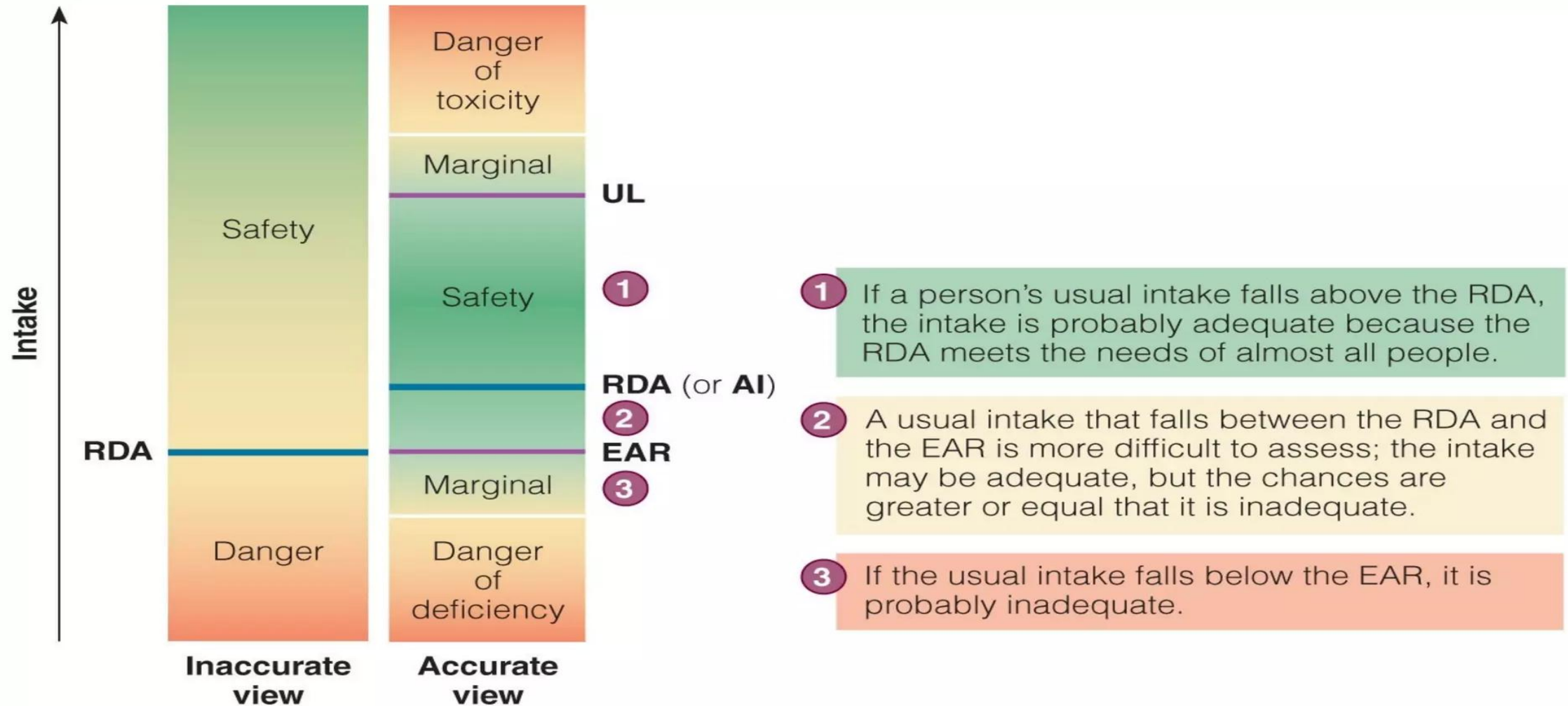
# Tolerable Upper Intake Level (UL):

The highest level of daily nutrient intake that has no adverse health effects or toxicity in almost all individuals

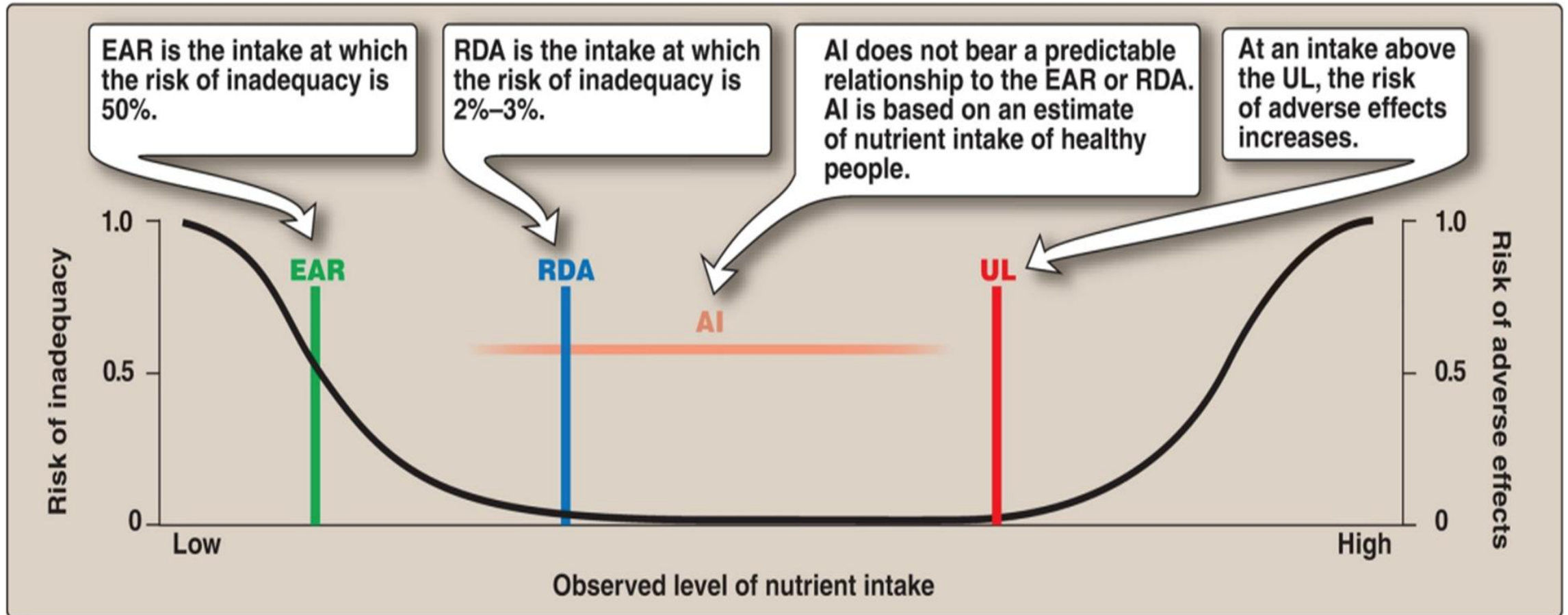
As intake increases above the UL, the potential risk of adverse effects may increase.



# Comparison of the components of the Dietary Reference Intakes



# Comparison of the components of the Dietary Reference Intakes

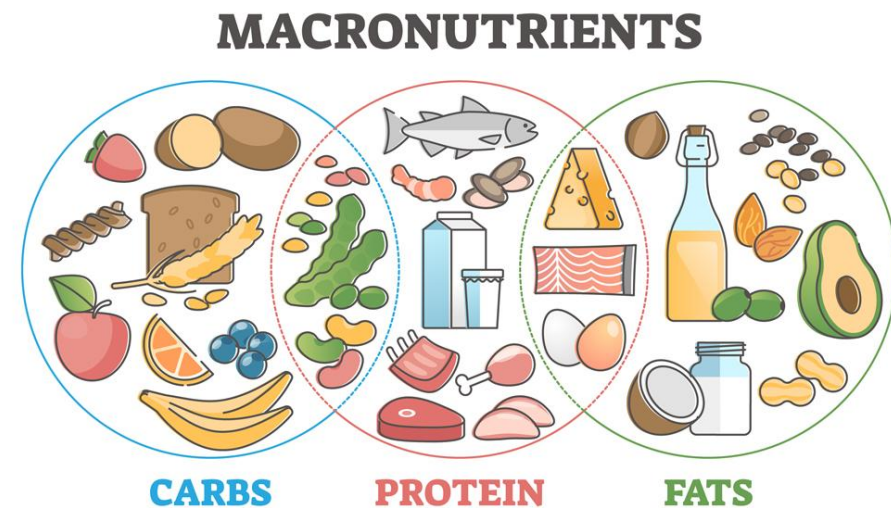


# Dietary Reference Intakes for vitamins and minerals in individuals one year and older.

NUTRIENT	EAR, RDA or AI	UL
Thiamine	EAR, RDA	—
Riboflavin	EAR, RDA	—
Niacin	EAR, RDA	UL
Vitamin B <sub>6</sub>	EAR, RDA	UL
Folate	EAR, RDA	UL
Vitamin B <sub>12</sub>	EAR, RDA	—
Pantothenic acid	AI	—
Biotin	AI	—
Choline	AI	UL
Vitamin C	EAR, RDA	UL
Vitamin A	EAR, RDA	UL
Vitamin D	AI	UL
Vitamin E	EAR, RDA	UL
Vitamin K	AI	—
Boron	—	UL
Calcium	AI	UL
Chromium	AI	—
Copper	EAR, RDA	UL
Fluoride	AI	UL
Iodine	EAR, RDA	UL
Iron	EAR, RDA	UL
Magnesium	EAR, RDA	UL
Manganese	AI	UL
Molybdenum	EAR, RDA	UL
Nickel	—	UL
Phosphorus	EAR, RDA	UL
Selenium	EAR, RDA	UL
Vanadium	—	UL
Zinc	EAR, RDA	UL





# Acceptable Macronutrient Distribution Ranges (ADMR)

- Range of adequate intake of a macronutrient associated with reduced risk of chronic diseases
- **ADMR** for adults (% of total calories)
  - **Carbohydrates** 45-65
  - **Fats** 20-35
  - **Proteins** 10-35
  - **Fiber** >25 g



# The USDA Food Patterns

- The USDA provides a food group plan
- USDA Food Patterns: Recommended Daily Amounts from Each Food Group

Food Group	1600 kcal	1800 kcal	2000 kcal	2200 kcal	  	2600 kcal	2000 kcal	 300 kcal
Fruits	1½ c	6 c	2 c	2 c	2 c	2 c	2½ c	1½ c
Vegetables	2 c	6 c	2½ c	2 c	3 c	2 c	3½ c	4 c
Grains	5 oz	6 oz	5 oz	7 oz	0 oz	8 oz	8 oz	10 oz
Protein foods	5 oz	5 oz	5 oz	17 oz	9 oz	7½ oz	3½ oz	7 oz
Milk	3 c	3 c	3 c	3 c	6 c	7 c	3 c	3 c
Oils	5 tsp	5 tsp	6 tsp	8 tsp	6 tsp	8 tsp	7 tsp	10 tsp
Discretionary kcalorie allowance	121 kcal	161 kcal	258 kcal	266 kcal	266 kcal	370 kcal	392 kcal	459 kcal

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# Vegetable Subgroups

- All vegetables provide an array of vitamins, fiber, and the mineral potassium, but some vegetables are especially good sources of certain nutrients and beneficial phytochemicals.
- For this reason, the vegetable group is sorted into five subgroups.

Subgroup	Description	Nutritional Benefits	Example Foods	Weekly Recommendation (1600–3000 kcal)
Dark green	Vegetables high in vitamins A, C, K, folate, and calcium	Supports bone, vision, and immune health	Spinach, kale, broccoli, collard greens	1½–2½ cups
Red and orange	Vegetables rich in carotenoids (provitamin A) and vitamin C	Supports vision, immune system, and antioxidants	Carrots, red peppers, pumpkin, sweet potatoes	4–7½ cups
Legumes	Beans, peas, lentils; also counted as protein	High in fiber, protein, iron, folate	Black beans, lentils, chickpeas	1–3 cups
Starchy vegetables	Vegetables high in carbohydrates	Provides energy and fiber	Potatoes, corn, peas	4–8 cups
Other vegetables	Non-starchy, other colors	Provides variety of vitamins and fiber	Onions, cucumbers, zucchini, mushrooms	3½–7 cups

# Protein Foods Subgroups

Also, protein foods group is sorted into three subgroups, each of these subgroups contributes a different assortment of fats.

Subgroup	Description	Nutritional Benefits	Example Foods	Weekly Recommendation (1600–3000 kcal)
<b>Seafood</b>	Fish and shellfish	High-quality protein, omega-3 fatty acids (EPA, DHA), vitamin D	Salmon, tuna, shrimp, cod	8–11 oz
<b>Meats, poultry, eggs</b>	Animal proteins excluding seafood	Protein, iron, zinc, B vitamins	Chicken, beef, turkey, eggs	24–34 oz
<b>Nuts, seeds, soy products</b>	Plant-based protein sources	Healthy fats, protein, fiber, minerals	Almonds, walnuts, sunflower seeds, tofu, soy milk	4–5 oz

# Nutrient density

## NUTRIENT DENSE FOODS

Foods that are high in nutrients but relatively low in calories



### HIGH IN...

- Fiber
- Essential Amino Acids
- Essential Fatty Acids
- Vitamins
- Minerals
- Antioxidants

## CALORIE DENSE FOODS

Foods that are high in calories but are lacking nutrients.

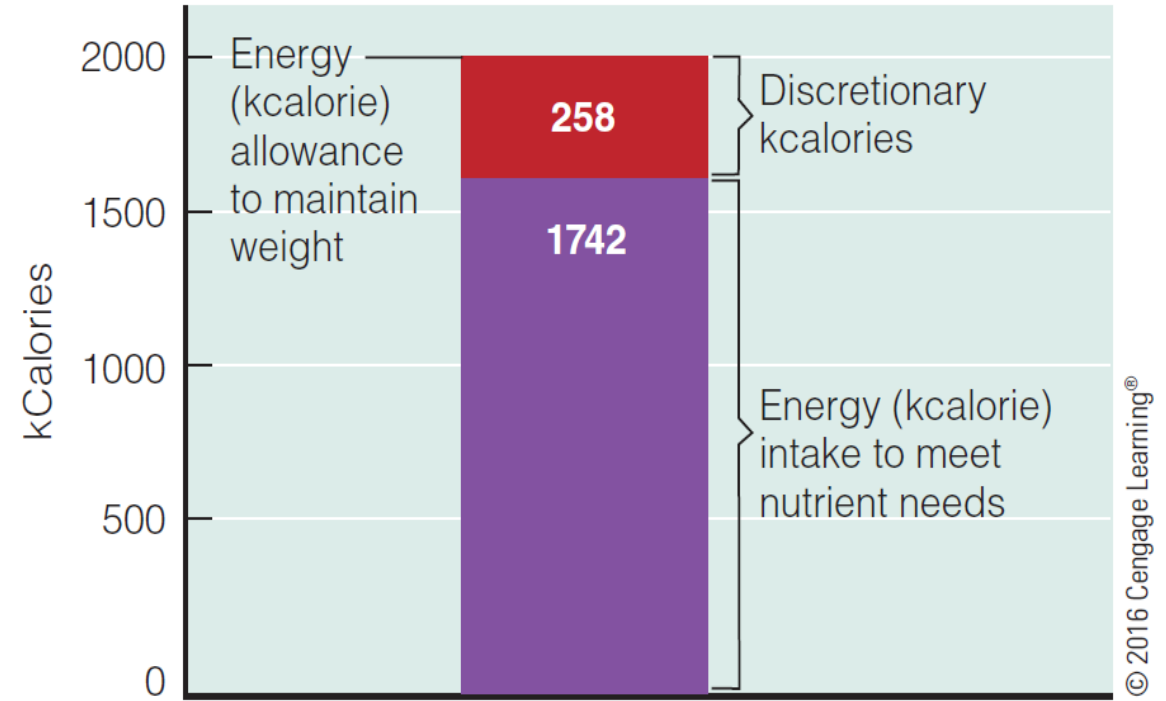


### HIGH IN...

- Added sugars
- Sodium
- Calories
- Saturated fat

# Discretionary kCalories

- Discretionary kcalories: the kcalories remaining in a person's energy allowance after consuming enough nutrient-dense foods to meet all nutrient needs for a day.



**FIGURE 1-5** Discretionary kCalories in a 2000-kCalorie Diet

# Discretionary kcalories allow a person to choose whether to:

- Eat additional **nutrient-dense foods**, such as an extra serving of skinless chicken or a second ear of corn.
- Select a few foods **with fats or added sugars**, such as reduced-fat milk or sweetened cereal.
- Add a little **fat or sugar to foods**, such as butter or jelly on toast.
- Alternatively, a person wanting to **lose weight** might choose to:
  - **Not use discretionary kcalories.**



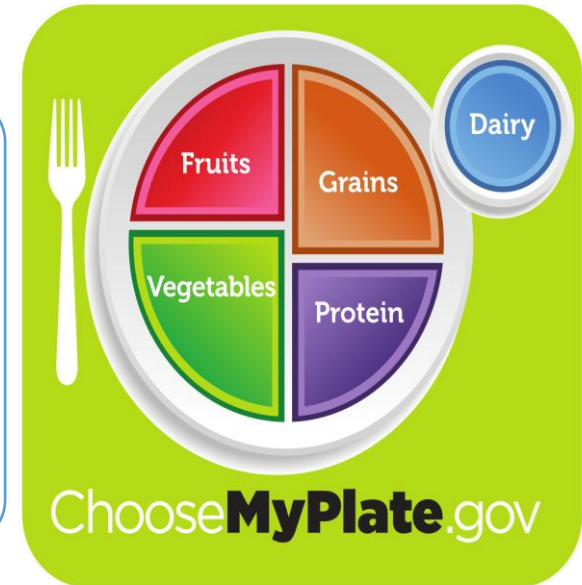
# My Plate

The USDA created an educational tool called My-Plate to illustrate the five food groups and remind consumers to make healthy food choices.

**My plate divides a plate into four sections, each representing a food group:**

**Fruits  
Vegetables  
Grains  
Protein foods.**

**The sections vary in size, indicating the relative proportion each food group contributes to a healthy diet**



# What's on the Food Label?

- Product name
- Manufacturer's name and address
- Amount in package
- Ingredients in descending order by weight
- Food allergens
  - Top 8: peanuts, tree nuts, milk, eggs, wheat, shellfish, fin fish, soy, sesame encourage as of Nov. 2020
- Nutrition Facts Panel



# Nutrition Facts Panel

- DRI not used on food label (age and gender specific)
- FDA developed Daily Values (DV) using two standards
  - ✓ Reference Daily Intakes (RDIs) for micronutrients with RDAs
    - Set at highest RDA for any age group >4 yrs
  - ✓ Daily Reference Value (DRV) for energy-producing nutrients and nutrients without RDAs

2000kcal reference diet with 35% fat, 55% carb. 10% protein

# Nutrition Facts Panel

- Nutrients expressed as % DV of 2000 kcal diet
  - % DV protein not needed, if stated then food must be analyzed for protein content by FDA (SSS)
  - % DV for protein required if labeled as high protein (>20% DV) or Low protein (<5% DV)



# NUTRITION FACT PANEL

Servings:  
larger,  
bolder type

## Nutrition Facts

8 servings per container

**Serving size** 2/3 cup (55g)

Amount per serving

**Calories** 230

% Daily Value\*

**Total Fat** 8g 10%

Saturated Fat 1g 5%

Trans Fat 0g

**Cholesterol** 0mg 0%

**Sodium** 160mg 7%

**Total Carbohydrate** 37g 13%

Dietary Fiber 4g 14%

Total Sugars 12g

Includes 10g Added Sugars 20%

**Protein** 3g

Vitamin D 2mcg 10%

Calcium 260mg 20%

Iron 8mg 45%

Potassium 240mg 6%

\* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Serving sizes  
updated

Calories:  
larger type

Daily Values  
Updated

New:  
added sugars

Change  
in some  
nutrients  
required

Actual  
amounts  
declared

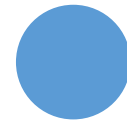
New  
footnote

# Nutrition assessment

- Nutrition assessment evaluates nutritional status based on clinical information. It includes:

1. Anthropometric measures
2. Biomedical data
3. Clinical Assessment
4. Dietary history

- Assessment findings may result in medical nutrition therapy, which is the treatment of medical conditions through changes in diet.



# Anthropometric measures

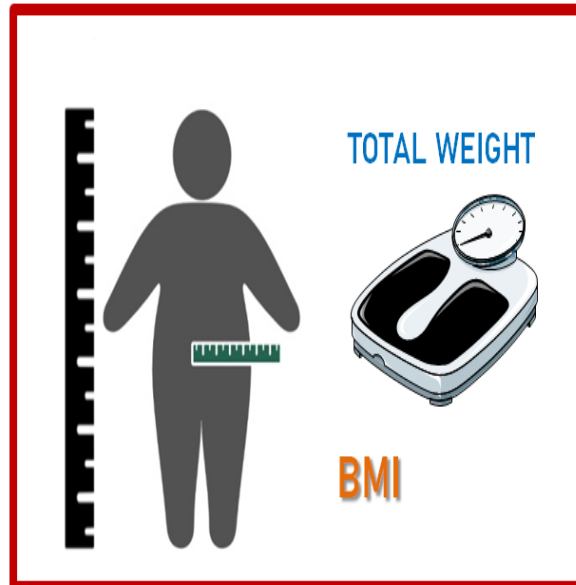
These are physical measures of the body. They include Weight, Height, Body mass index (an indicator of obesity)

Skin-fold thickness (an indicator of subcutaneous fat)

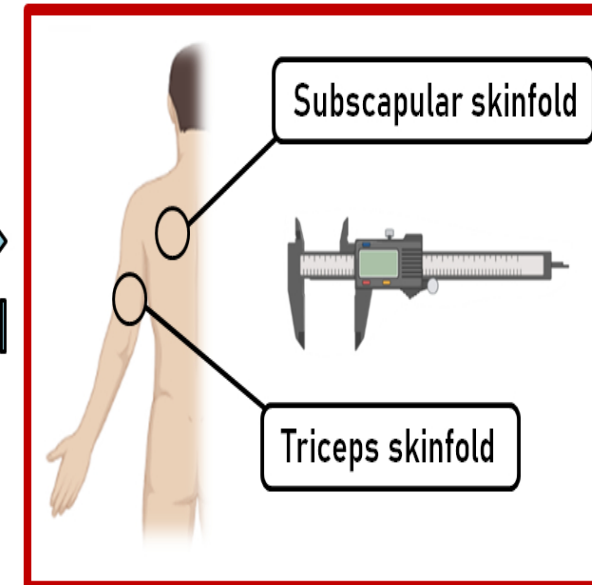
Waist circumference (an indicator of abdominal fat)



TRADICIONAL ANTHROPOMETRIC MEASURES



ADDITIONAL ANTHROPOMETRIC MEASURES



# Biomedical data:

- These are obtained by tests performed on body fluids, tissues, and waste.
- They can include plasma LDL-C (for cardiovascular risk), fecal fat (for malabsorption), red cell indices (for vitamin deficiencies), and N balance and serum proteins (such as albumin and transthyretin [prealbumin]) for protein-energy status.

**Table 1. Normal laboratory values of selected nutrition indicators**

Lab test	Normal range
Albumin	3.5–5.0 g/dL
Prealbumin	16–36 mg/dL
Retinol binding protein	2.6–7.6 mg/dL
C-reactive protein	<0.8 mg/dL
Cholesterol	<200 mg/dL
Transferrin	212–360 mg/dL
Total lymphocyte count	≥1,800 cubic millimeter (mm <sup>3</sup> )

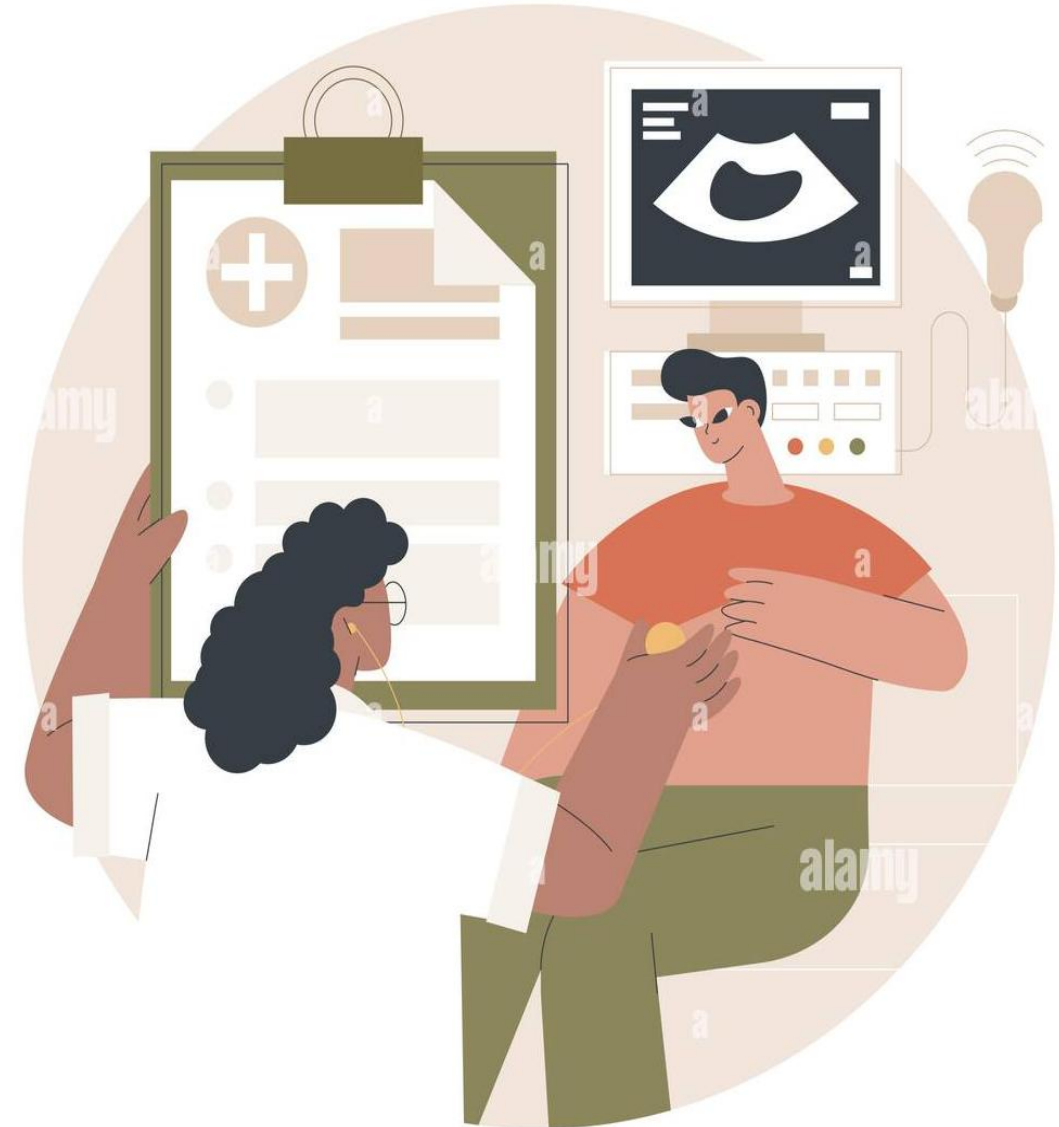
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# Clinical Assessment:

- Include Oral, physical, and cognitive function, their medical history, medication use, signs and symptoms of malnutrition, deficiency or disease



# Dietary history

This is a record of food intake over a period of time.

For a food diary, the specific types and exact amounts of food eaten are recorded in "real time" (as soon as possible after eating) for a period of 3-7 days.

FOODS AND AMOUNTS	AVERAGE USE LAST YEAR									
	Never or less than once/month	1-3 per month	Once a week	2-4 per week	5-6 per week	Once a day	2-3 per day	4-5 per day	6+ per day	
<b>BREAD AND SAVOURY BISCUITS</b> (one slice or biscuit)										
White bread and rolls						✓				
Brown bread and rolls				✓						
Wholemeal bread and rolls	✓									
Cream crackers, cheese biscuits		✓								
Crispbread, eg. Ryvita		✓								
<b>CEREALS</b> (one bowl)										
Porridge, Readybrek				✓						
Breakfast cereal such as cornflakes, muesli etc.					✓					

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