DIETARY REFERENCE INTAKE

PHAR-432

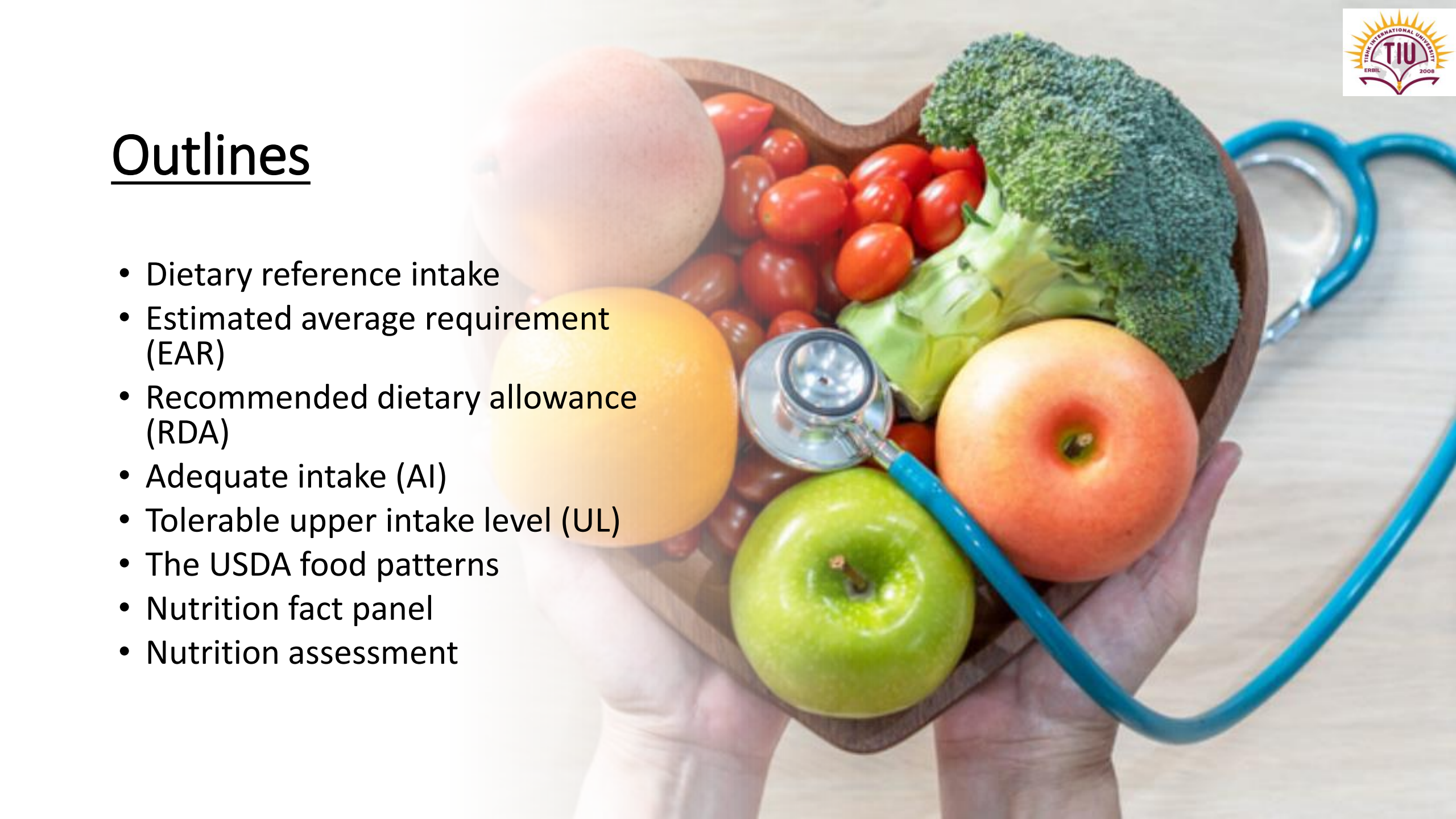
LECTURE: 2

Assist. Lecturer: Alaa Amer Mohammad
Email : alaa.amer@tiu.edu.iq

Spring Semester (2023-2024)

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 ALLOW
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):

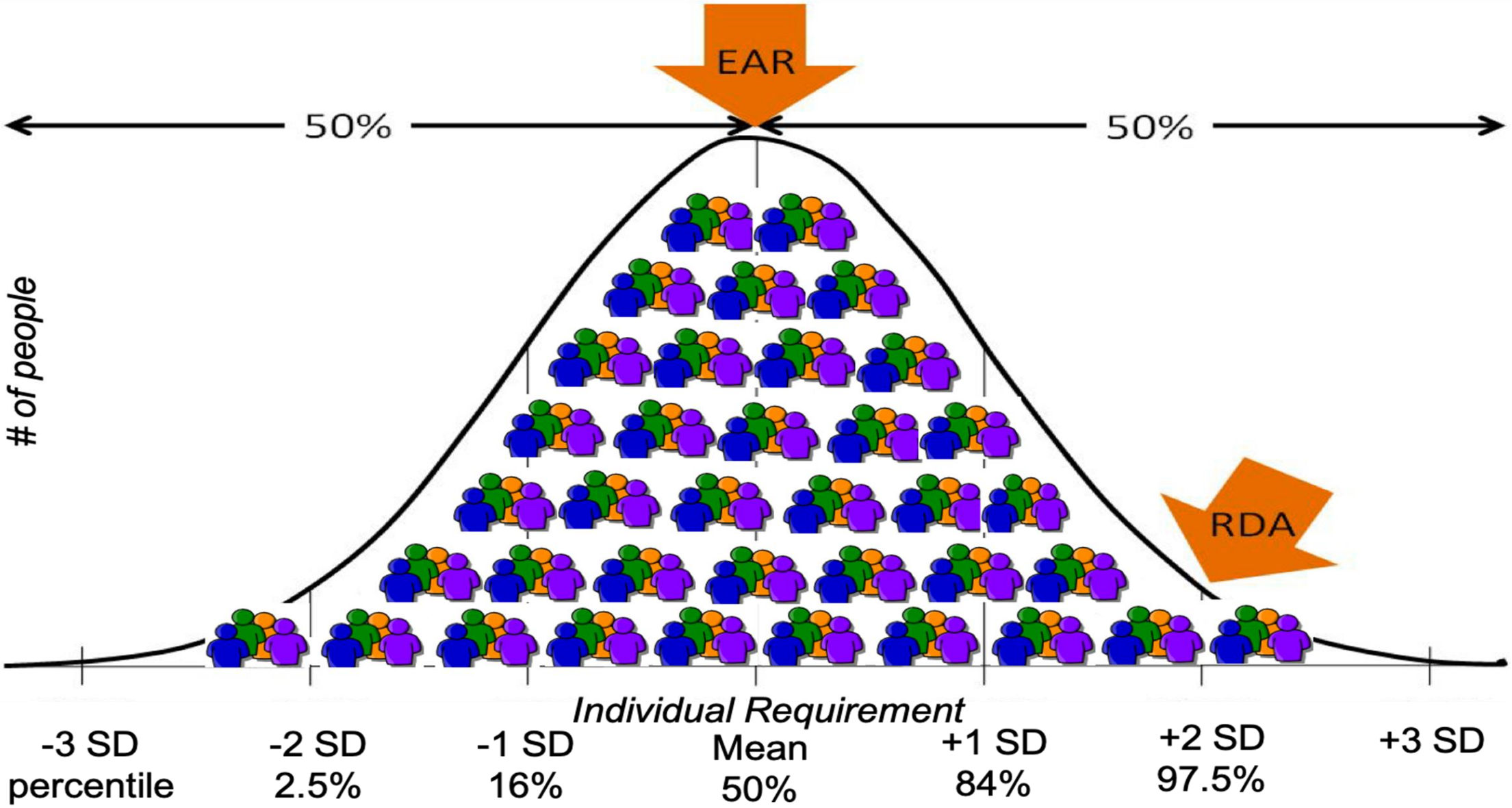
The EAR is the average daily nutrient intake level estimated to meet the requirement of one half of the healthy individuals in a particular life stage and gender group.

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

Recommended Dietary Allowance (RDA):

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

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


EAR
50%
50%
# of people
RDA
Individual Requirement
-3 SD
percentile
-2 SD
2.5%
-1 SD
16%
Mean
50%
+1 SD
84%
+2 SD
97.5%
+3 SD

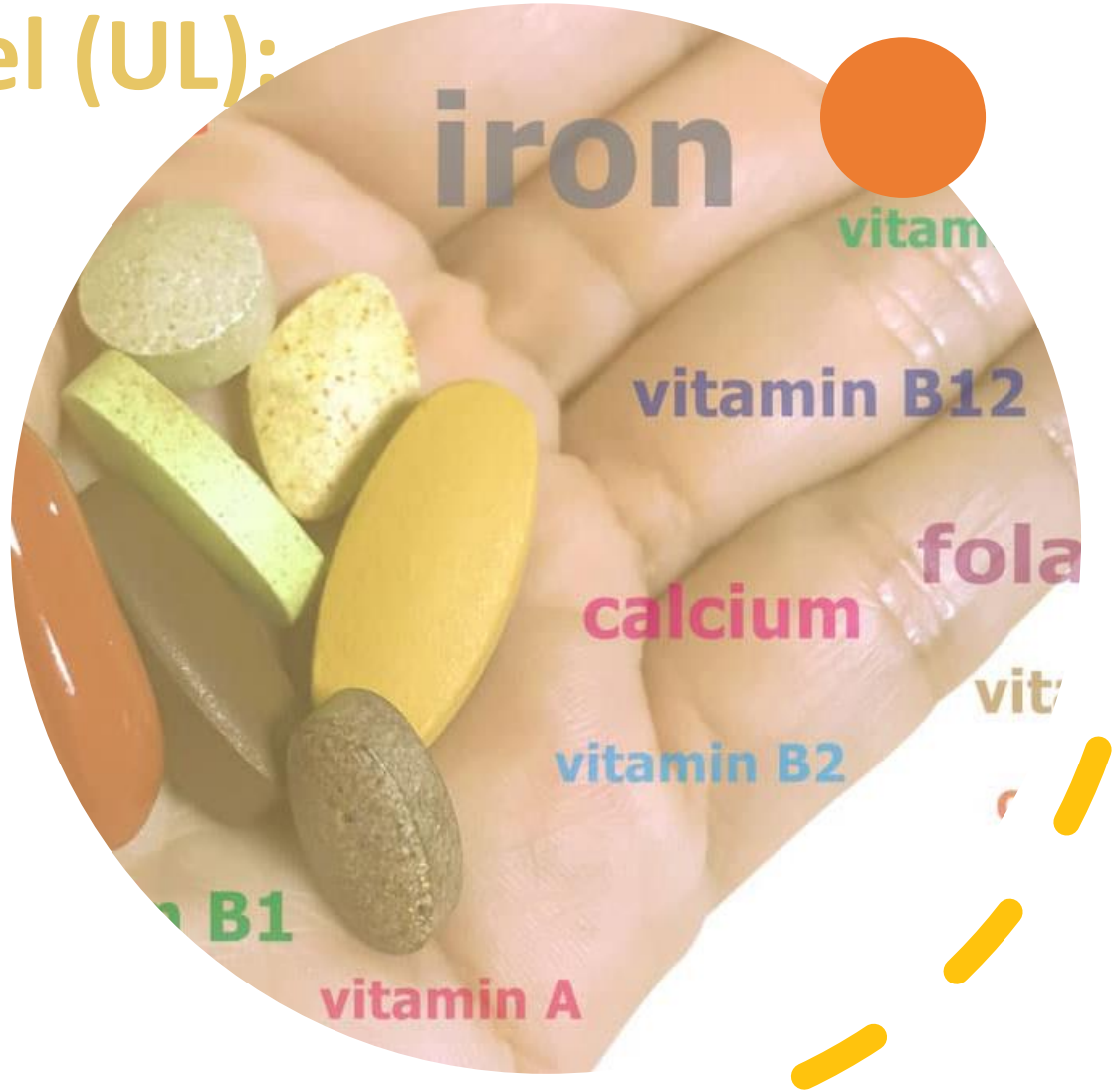
Adequate Intake (AI):

- 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

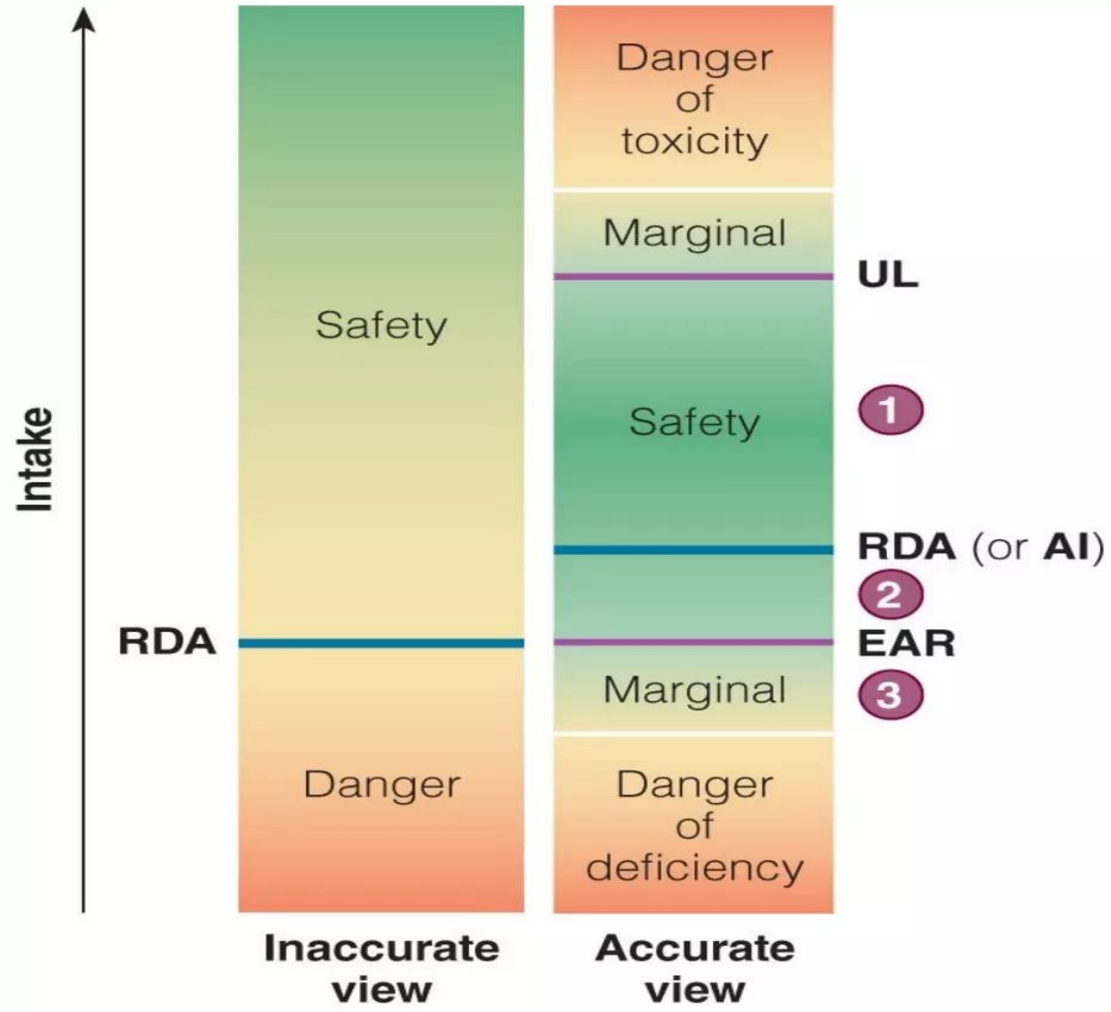
Tolerable Upper Intake Level (UL):

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.

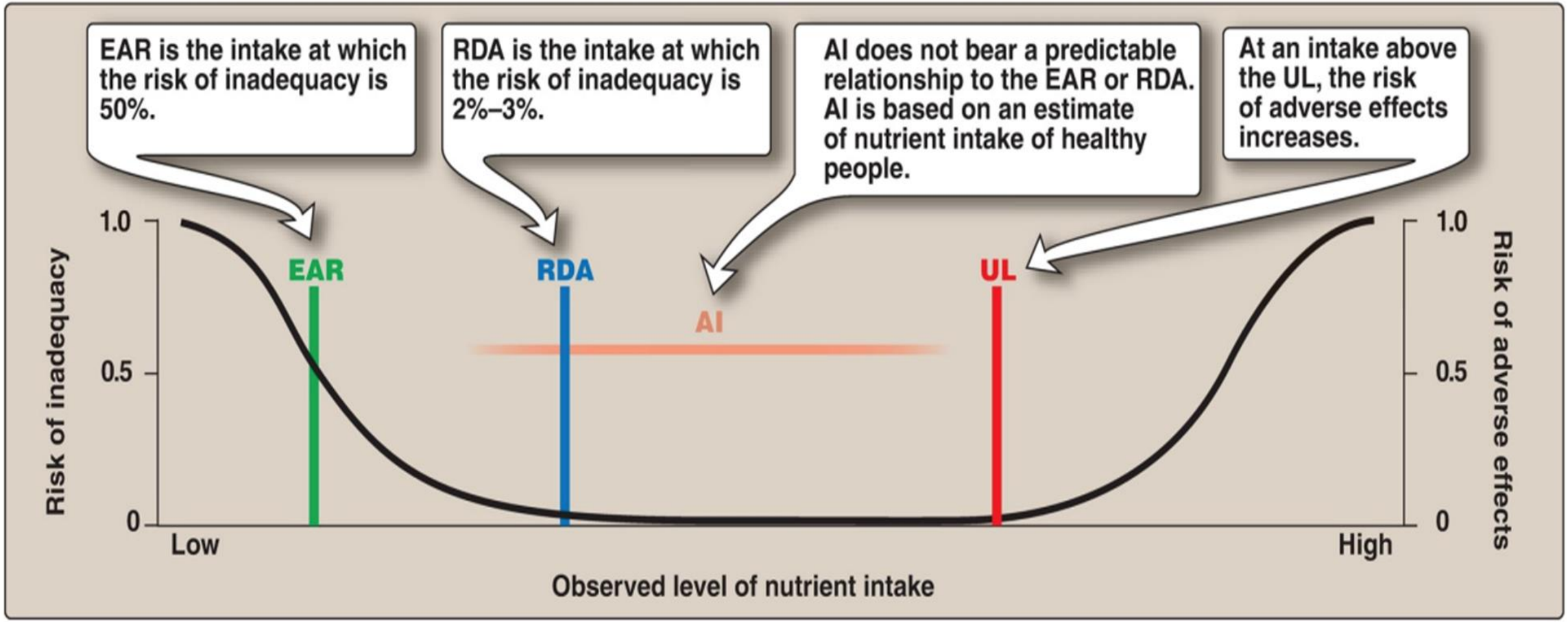


Comparison of the components of the Dietary Reference Intakes



1. If a person's usual intake falls above the RDA, the intake is probably adequate because the RDA meets the needs of almost all people.
2. A usual intake that falls between the RDA and the EAR is more difficult to assess; the intake may be adequate, but the chances are greater or equal that it is inadequate.
3. If the usual intake falls below the EAR, it is probably inadequate.

Comparison of the components of the Dietary Reference Intakes

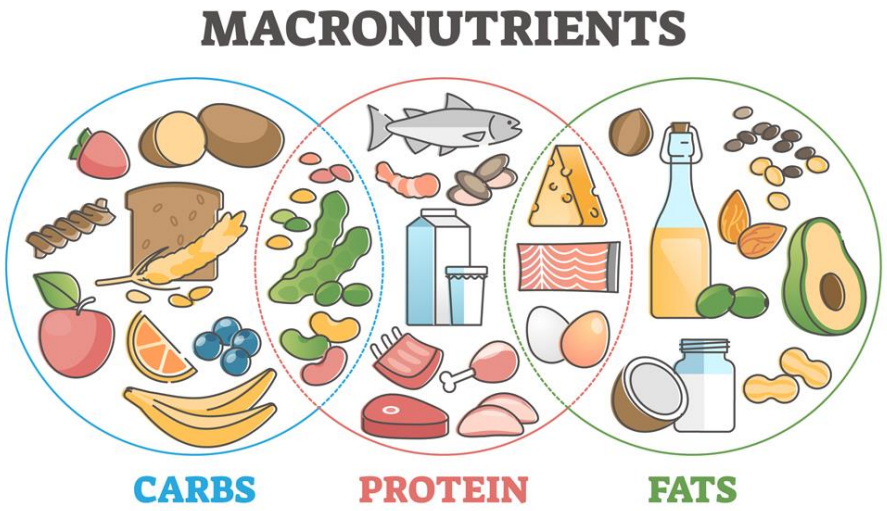


Dietary Reference Intakes for vitamins and minerals in individuals one year and older.

NUTRIENT	EAR, RDA or AI	UL
Thiamine	EAR, RDA	—
Riboflavin	EAR, RDA	—
Niacin	EAR, RDA	UL
Vitamin B_6	EAR, RDA	UL
Folate	EAR, RDA	UL
Vitamin B_{12}	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	2400 kcal	2600 kcal	2800 kcal	3000 kcal
Fruits	1½ c	1½ c	2 c	2 c	2 c	2 c	2½ c	2½ c
Vegetables	2 c	2½ c	2½ c	3 c	3 c	3½ c	3½ c	4 c
Grains	5 oz	6 oz	6 oz	7 oz	8 oz	9 oz	10 oz	10 oz
Protein foods	5 oz	5 oz	5½ oz	6 oz	6½ oz	6½ oz	7 oz	7 oz
Milk	3 c	3 c	3 c	3 c	3 c	3 c	3 c	3 c
Oils	5 tsp	5 tsp	6 tsp	6 tsp	7 tsp	8 tsp	8 tsp	10 tsp
Discretionary kcalorie allowance	121 kcal	161 kcal	258 kcal	266 kcal	330 kcal	362 kcal	395 kcal	459 kcal

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.

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

TABLE 1-6 USDA Food Patterns: Recommended Weekly Amounts from the Vegetable and Protein Foods Subgroups

Vegetable Subgroups	1600 kcal	1800 kcal	2000 kcal	2200 kcal	2400 kcal	2600 kcal	2800 kcal	3000 kcal
Dark green	1½ c	1½ c	1½ c	2 c	2 c	2½ c	2½ c	2½ c
Red and orange	4 c	5½ c	5½ c	6 c	6 c	7 c	7 c	7½ c
Legumes	1 c	1½ c	1½ c	2 c	2 c	2½ c	2½ c	3 c
Starchy	4 c	5 c	5 c	6 c	6 c	7 c	7 c	8 c
Other	3½ c	4 c	4 c	5 c	5 c	5½ c	5½ c	7 c
Protein Foods Subgroups								
Seafood	8 oz	8 oz	8 oz	9 oz	10 oz	10 oz	11 oz	11 oz
Meats, poultry, eggs	24 oz	24 oz	26 oz	29 oz	31 oz	31 oz	34 oz	34 oz
Nuts, seeds, soy products	4 oz	4 oz	4 oz	4 oz	5 oz	5 oz	5 oz	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.

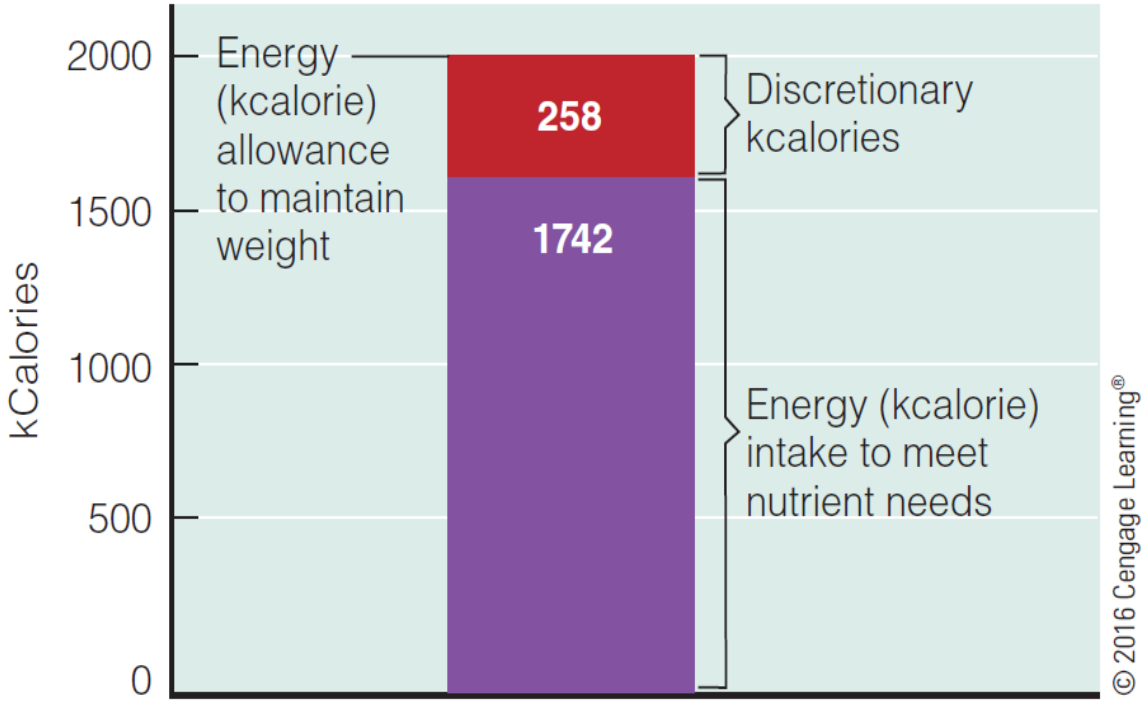


FIGURE 1-5 Discretionary kCalories in a 2000-kCalorie Diet

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:

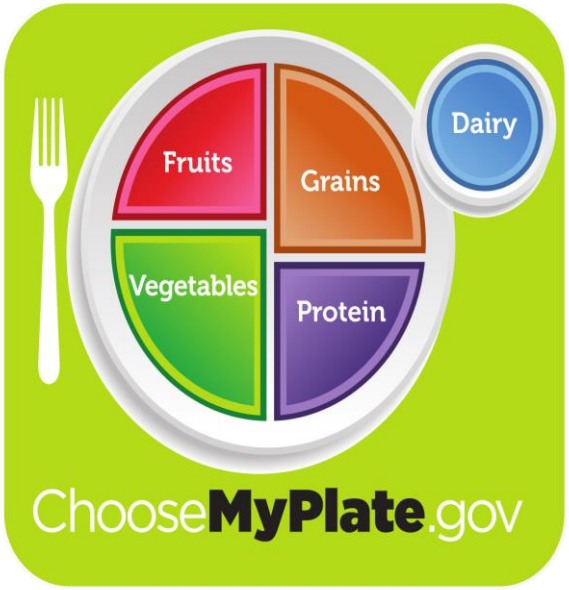
Fruits

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

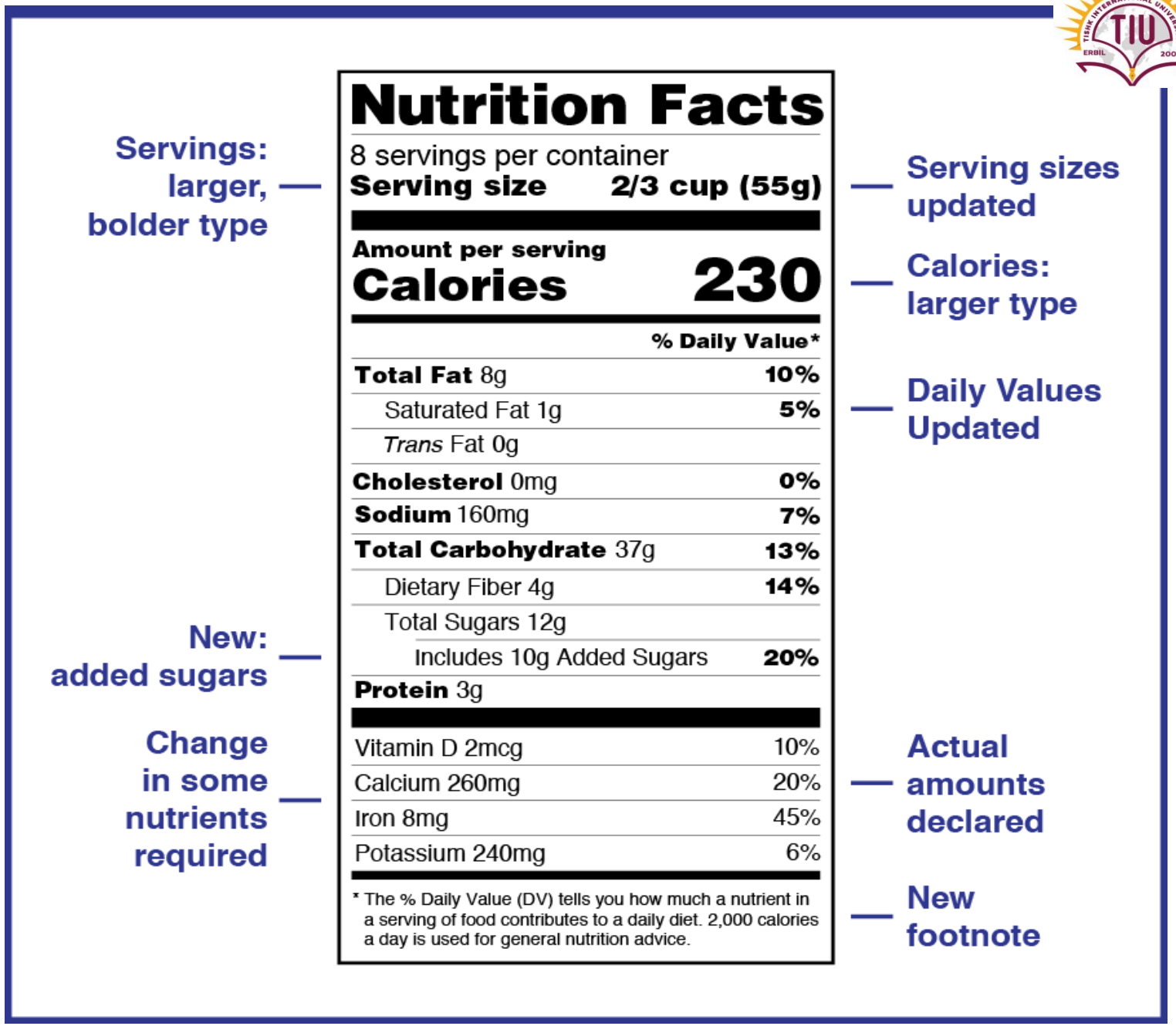
Nutrition Facts Panel

- 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



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

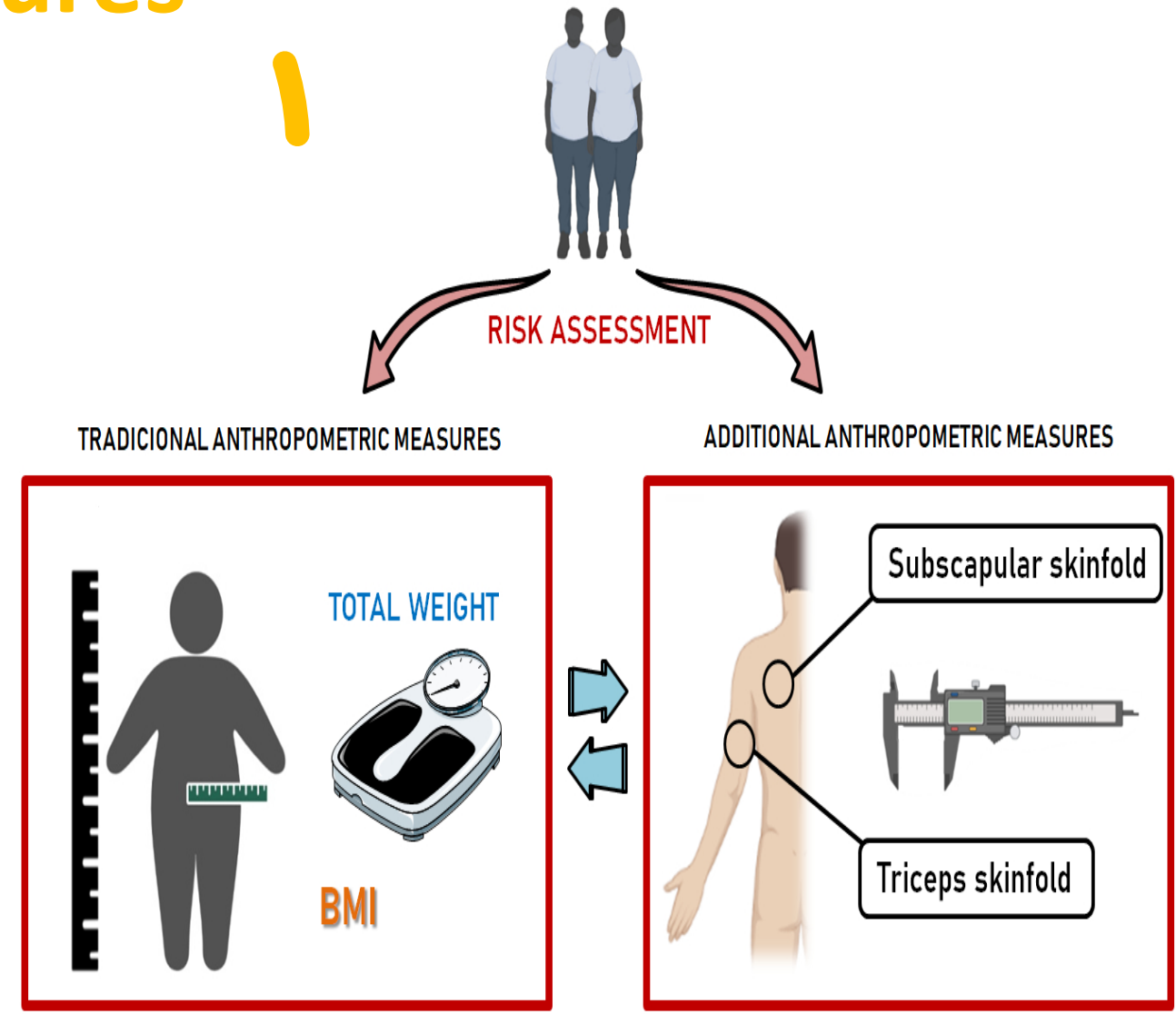
- Assessment findings may result in medical nutrition therapy, which is the treatment of medical conditions through changes in diet.

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)



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.

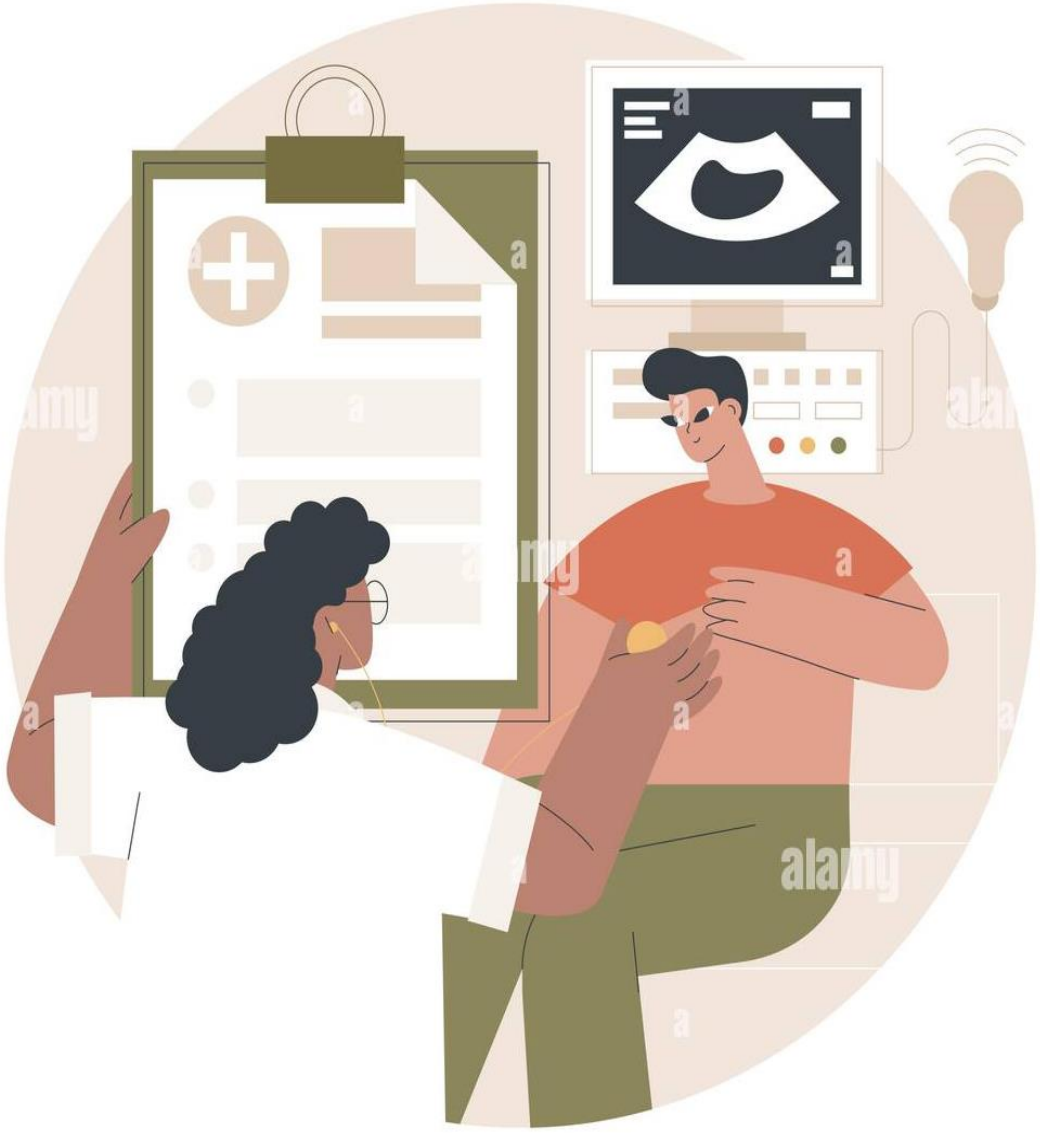
Table 1. Normal laboratory values of selected nutrition indicators

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^3)

Sources:
Litchford ML. *The Advanced Practitioner's Guide to Nutrition and Wounds*. Greensboro, NC: Case Software and Books; 2006.
Pronsky ZM. *Food Medication Interactions, 15th ed.* Birchrunville PA; 2008.

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								
BREAD AND SAVOURY BISCUITS (one slice or biscuit)	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
White bread and rolls						✓			
Brown bread and rolls				✓					
Wholemeal bread and rolls	✓								
Cream crackers, cheese biscuits		✓							
Crispbread, eg. Ryvita		✓							
CEREALS (one bowl)									
Porridge, Readybrek				✓					
Breakfast cereal such as cornflakes, muesli etc.					✓				

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