Cardiology and Healthy Living

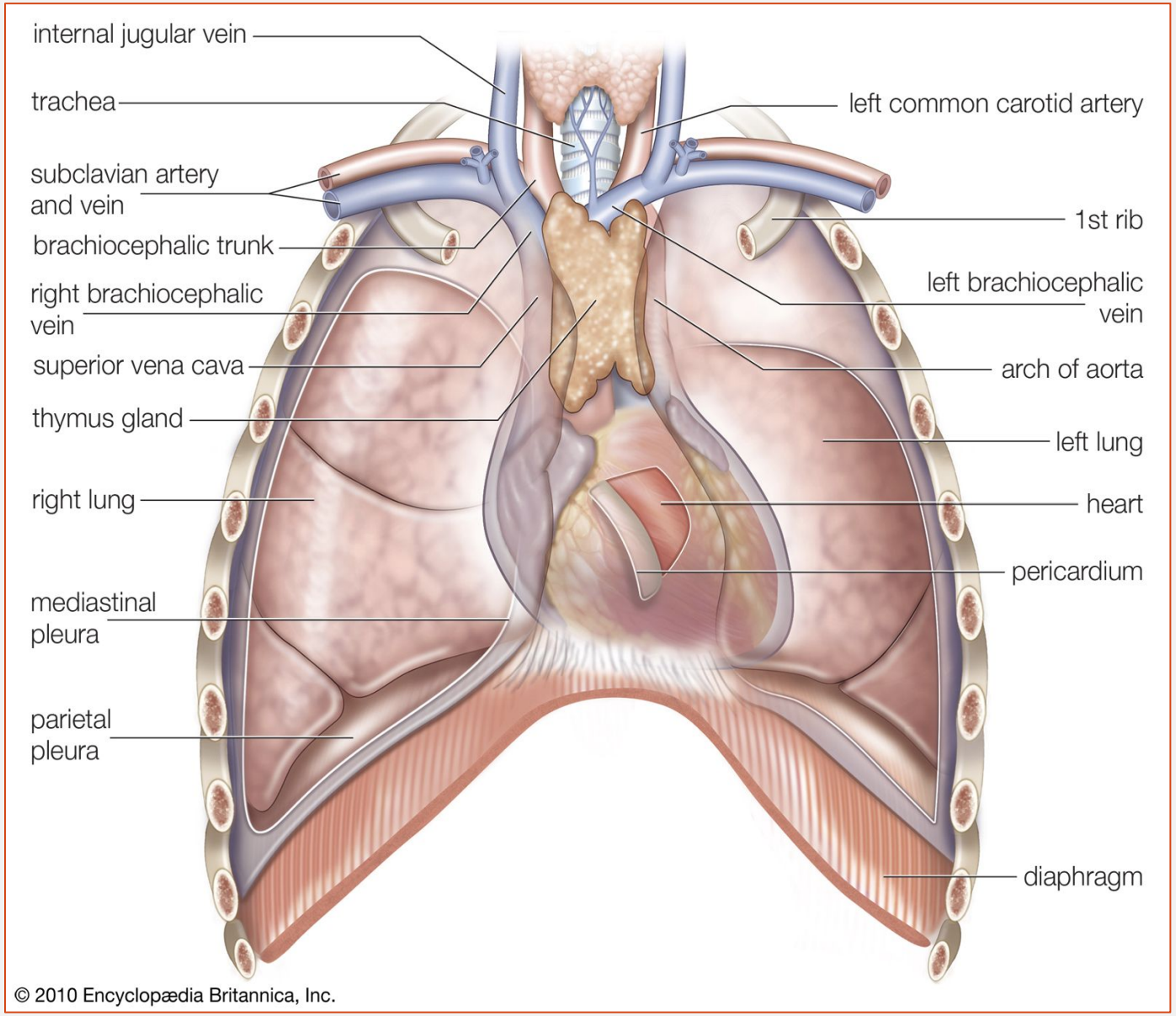
Mini-Med Fall 2021

But first … sign ups for the mock patient interview next week!

- Counts as one extracurricular credit (remember, need at least 3 to achieve honors distinction)
- Next week we will start with a few mock patient interviews
- It's a great opportunity to see what being a doctor is really like!
- Any volunteers?

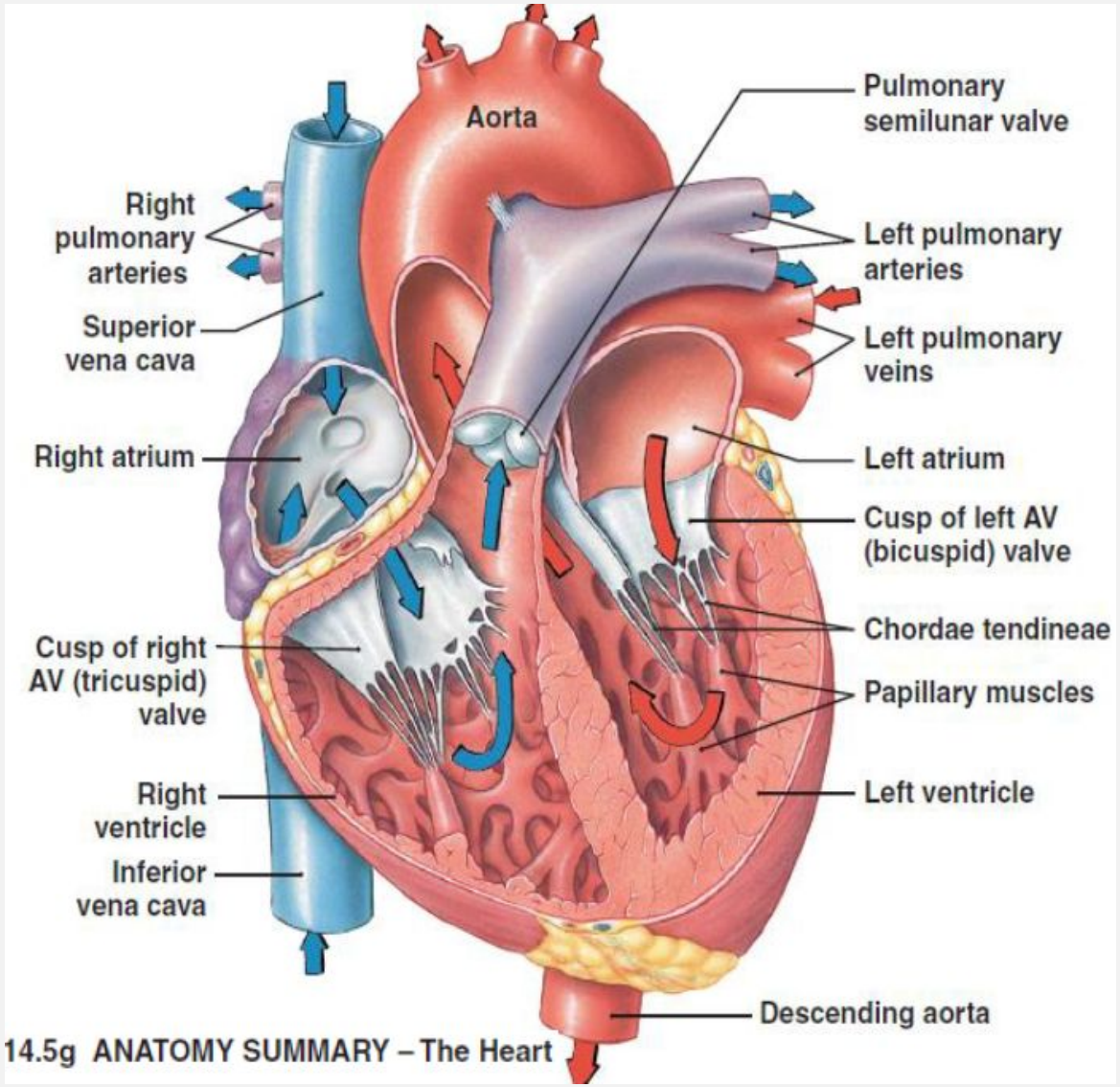
The Heart

- Muscular organ located in the thorax, between the lungs and above the diaphragm
- Roughly the size of an adult fist
- Pumping about 2,000 gallons of blood volume daily

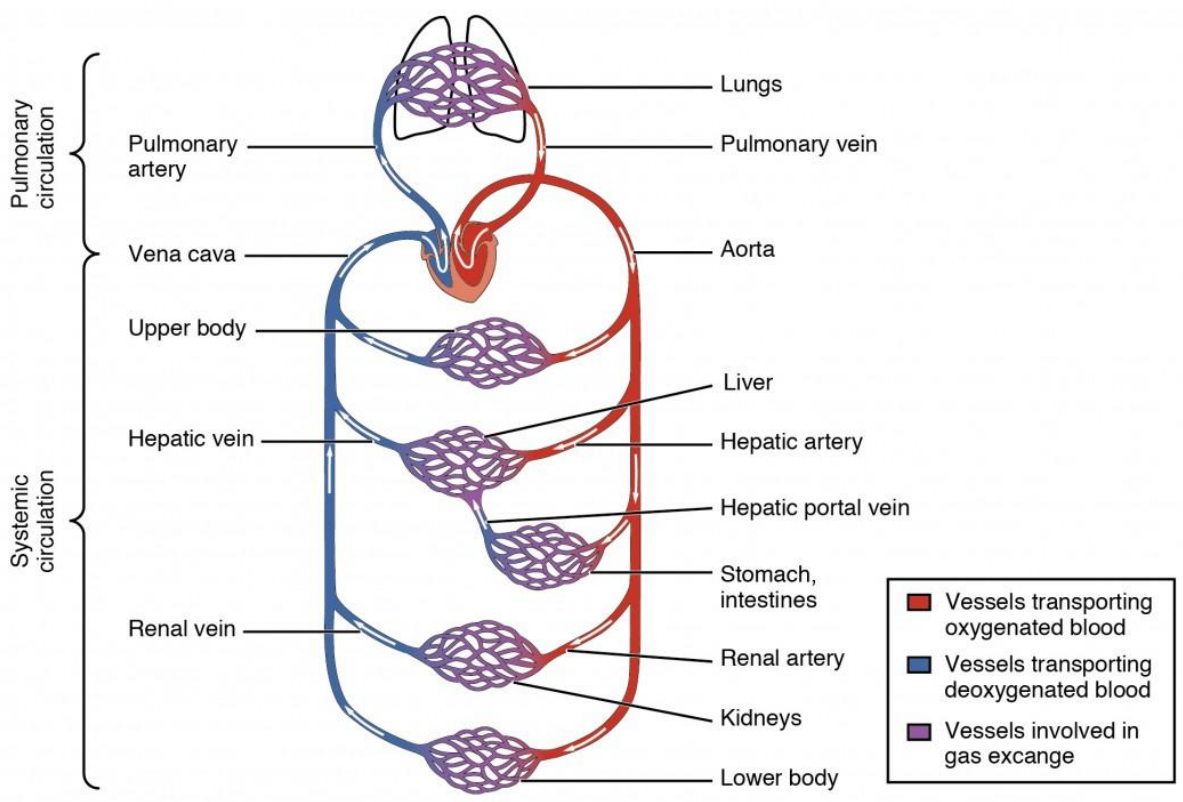


Anatomy of the Heart

- Divided into 4 chambers
  - 2 atria (right atrium and left atrium) at the top
  - 2 ventricles (right ventricle and left ventricle) at the bottom
- Atria receive blood into the heart, while ventricles pump blood out of the heart
- Chronologically, blood flows from vena cava → right atrium → right ventricle → pulmonary arteries → lungs → pulmonary veins → left atrium → left ventricle → aorta
- Chambers of the heart are separated by 4 valves that ensure unidirectional blood flow



Cardiac Circulations



- **Systemic circulation**: allows blood to flow to and from the rest of the body
  - Heart (left ventricle) → aorta → rest of body → veins → vena cava → back to the heart (right atrium)
- **Pulmonary circulation**: allows blood flow between the heart and the lungs
  - Heart (right ventricle) → pulmonary arteries → lungs → pulmonary veins → heart (left atrium)

Vasculature

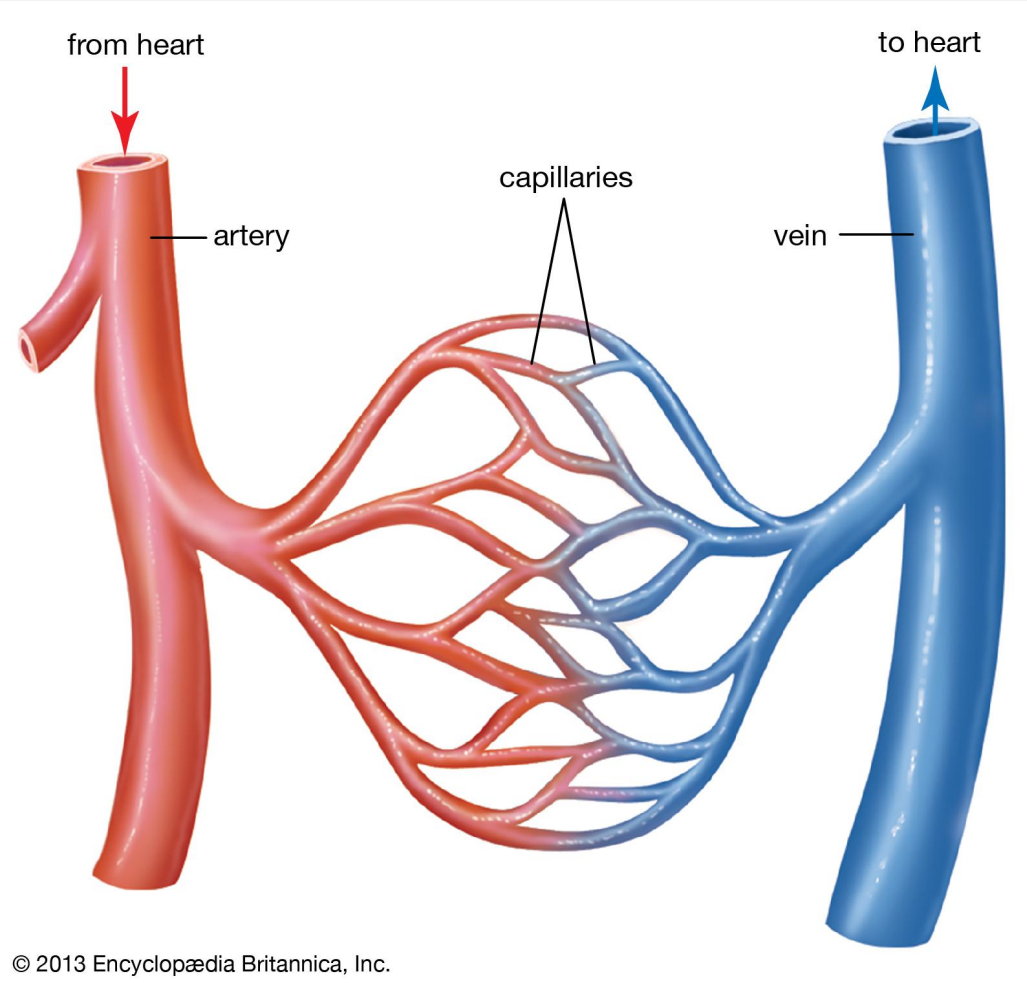
- If you took all the blood vessels of an average adult out and laid them in one line, the vasculature would:
  - stretch ~100,000 miles
  - Wrap around the circumference of the earth ~4 times

There are three kinds of **blood vessels:**

1. Arteries: Carry blood **away** from the heart
2. Veins: Carry blood **toward** the heart
3. Capillaries: Very small. Deliver and absorb oxygen, nutrients, and other solutes to tissues throughout the body

All arteries carry oxygenated blood, with one exception (which we will see on the next slide)

All veins carry deoxygenated blood, with one exception (which we will see on the next slide)



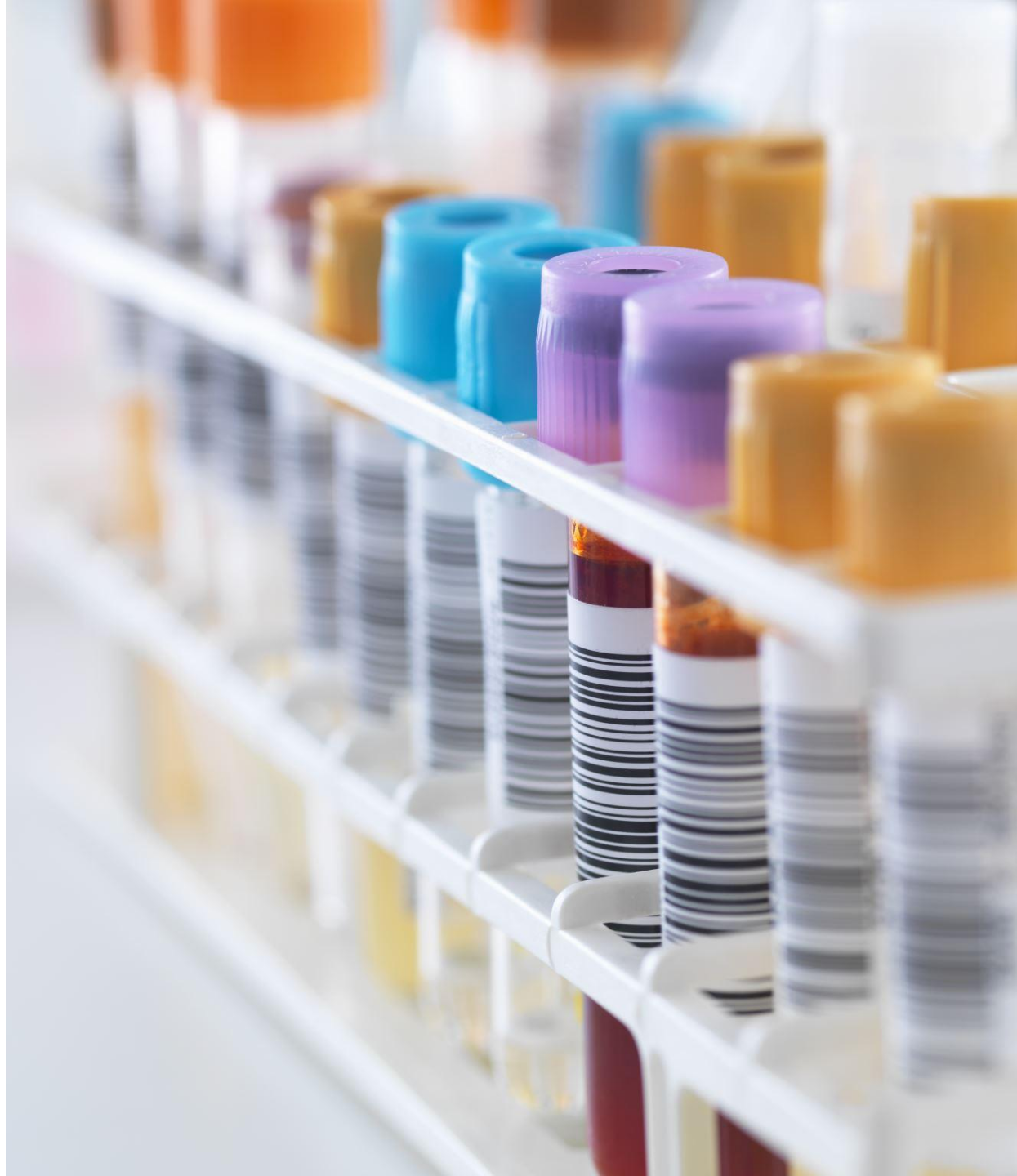
The pulmonary artery carries _____ blood away from the heart, while the pulmonary vein carries _____ blood towards the heart. (Hint: this an exception to the rule)

A. Oxygenated; oxygenated

B. Deoxygenated; oxygenated

C. Oxygenated; deoxygenated

D. Deoxygenated; deoxygenated



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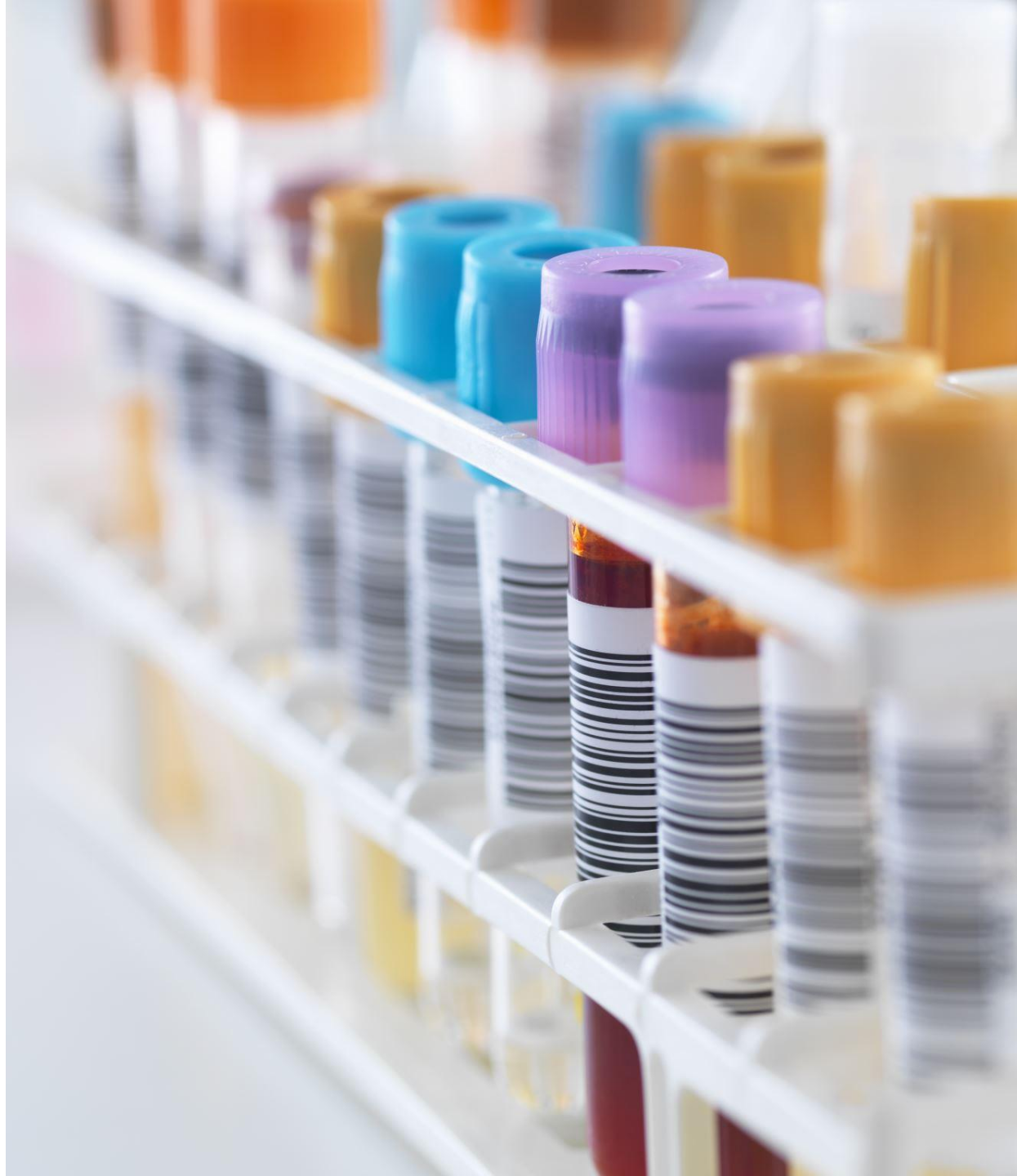
B. **Deoxygenated; oxygenated**

C. Oxygenated; deoxygenated

D. Deoxygenated; deoxygenated

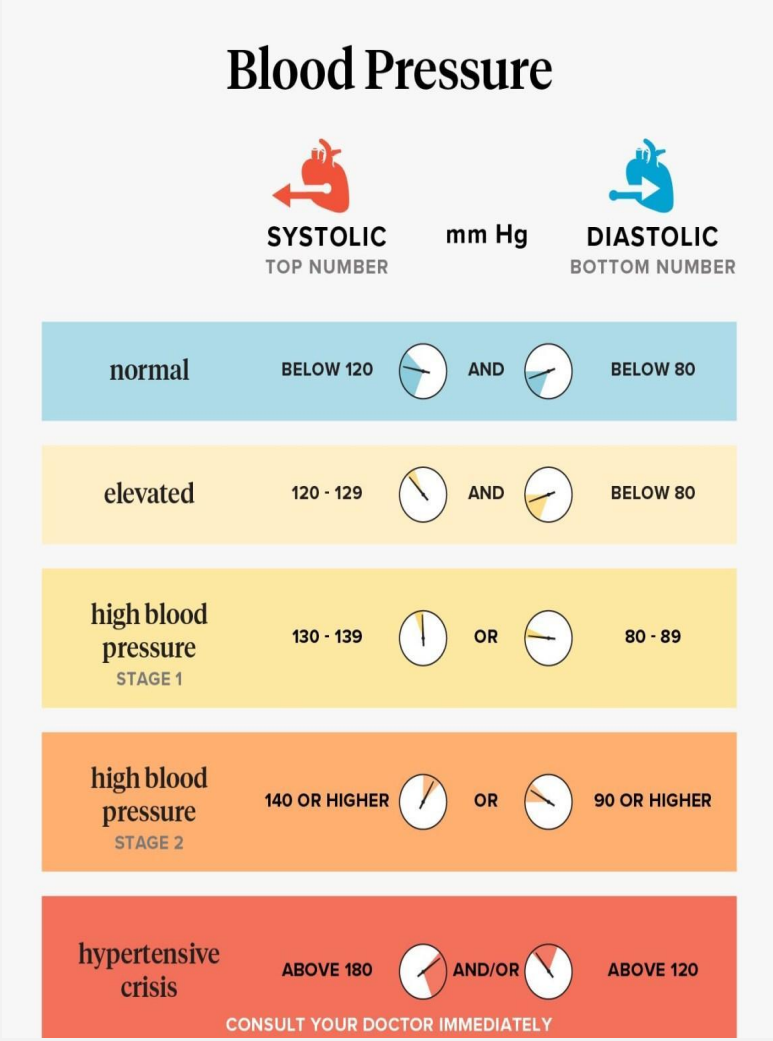
The reason why blood in the pulmonary arteries needs to go to the lungs in the first place is to get oxygenated. Thus, the pulmonary artery carries deoxygenated blood away from the heart

The pulmonary veins travels into the heart, but are carrying the blood that was just oxygenated in the lungs



Blood Pressure (BP) and Heart Rate (HR)

- **Blood Pressure (BP):** the force of blood pushing against vessel walls that maintains circulation
  - Measured as a ratio of systolic over diastolic pressure (ex. 120/80)
    - **Systolic**: BP during contraction of the heart
    - **Diastolic**: BP during relaxation of the heart
- **Heart Rate (HR):** # of times the heart beats per minute
  - The heart beats ~100,000 times daily and ~2.5 billion times in the average person's lifetime



Resting Heart Rate Chart

Men (beats per minute)

Age	18 - 25	26 - 35	36 - 45	46 - 55	56 - 65	65 +
Athlete	49 - 55	49 - 54	50 - 56	50 - 57	51 - 56	50 - 55
Excellent	56 - 61	55 - 61	57 - 62	58 - 63	57 - 61	56 - 61
Great	62 - 65	62 - 65	63 - 66	64 - 67	62 - 67	62 - 65
Good	66 - 69	66 - 70	67 - 70	68 - 71	68 - 71	66 - 69
Average	70 - 73	71 - 74	71 - 75	72 - 76	72 - 75	70 - 73
Below Average	74 - 81	75 - 81	76 - 82	77 - 83	76 - 81	74 - 79
Poor	82 +	82 +	83 +	84 +	82 +	80 +

Women (beats per minute)

Age	18 - 25	26 - 35	36 - 45	46 - 55	56 - 65	65 +
Athlete	54 - 60	54 - 59	54 - 59	54 - 60	54 - 59	54 - 59
Excellent	61 - 65	60 - 64	60 - 64	61 - 65	60 - 64	60 - 64
Great	66 - 69	65 - 68	65 - 69	66 - 69	65 - 68	65 - 68
Good	70 - 73	69 - 72	70 - 73	70 - 73	69 - 73	69 - 72
Average	74 - 78	73 - 76	74 - 78	74 - 77	74 - 77	73 - 76
Below Average	79 - 84	77 - 82	79 - 84	78 - 83	78 - 83	77 - 84
Poor	85 +	83 +	85 +	84 +	84 +	85 +

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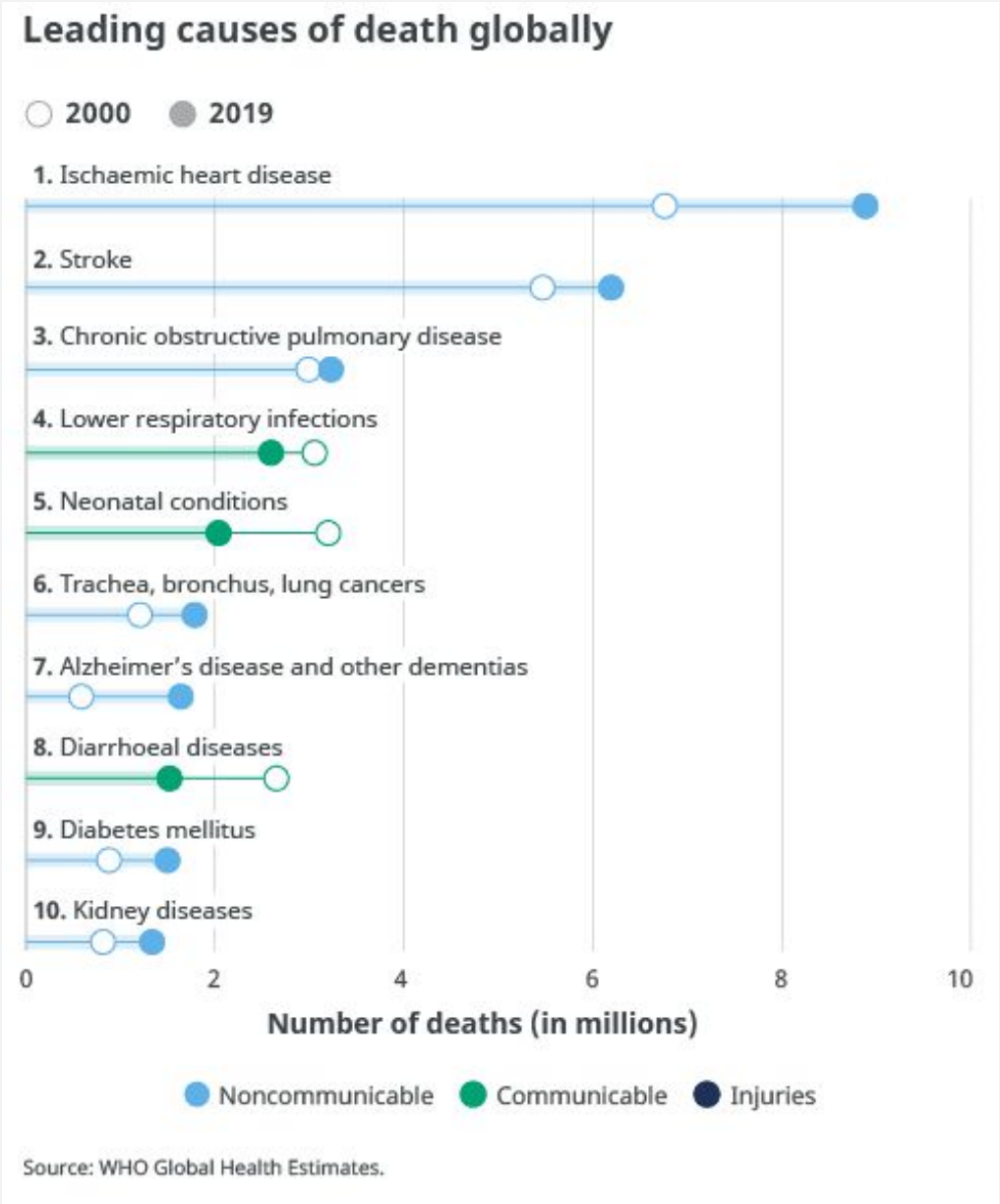
What is the leading cause of death globally?

A. Cancer
B. COVID-19
C. Heart disease
D. Suicide
E. Vehicle accidents



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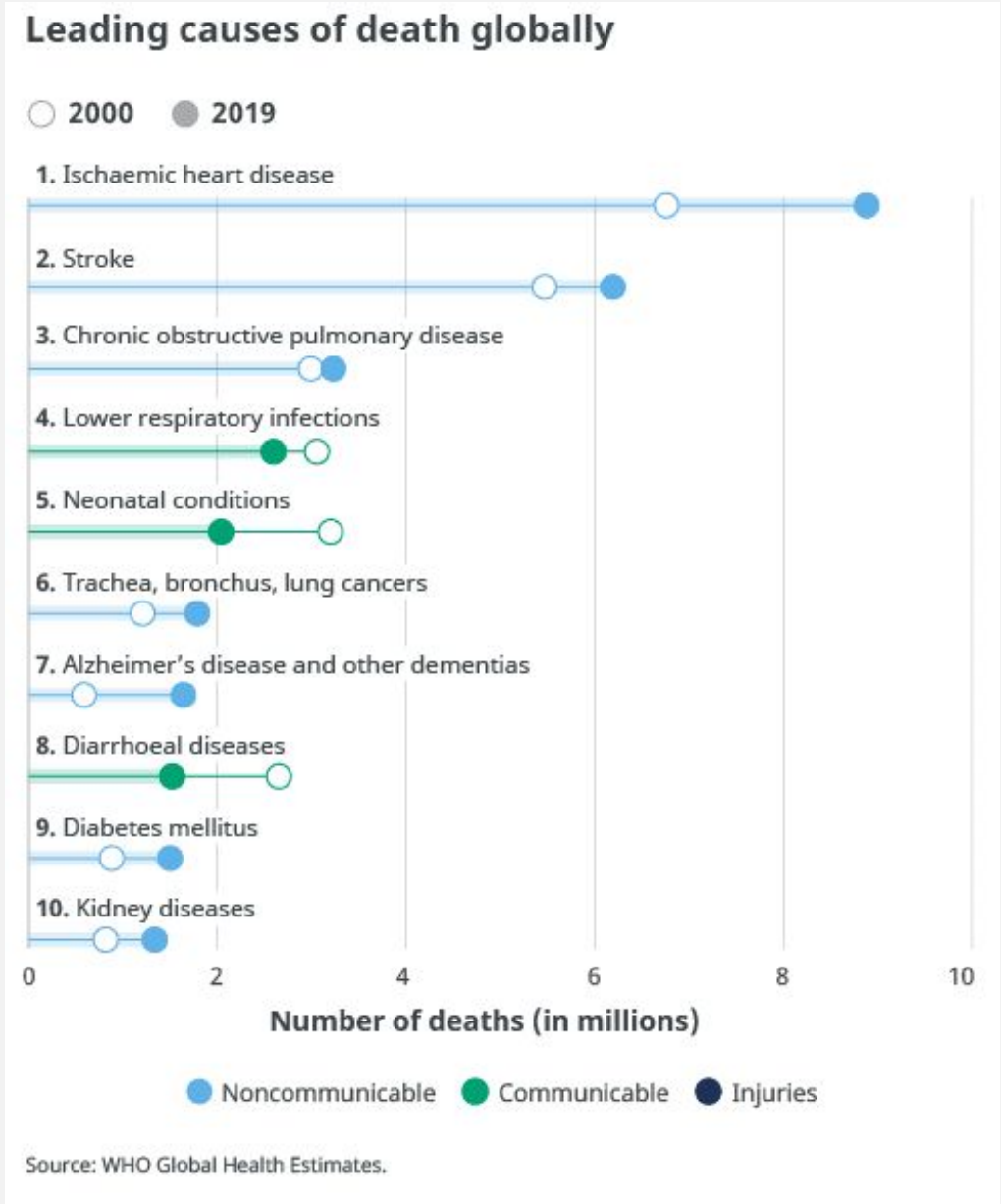
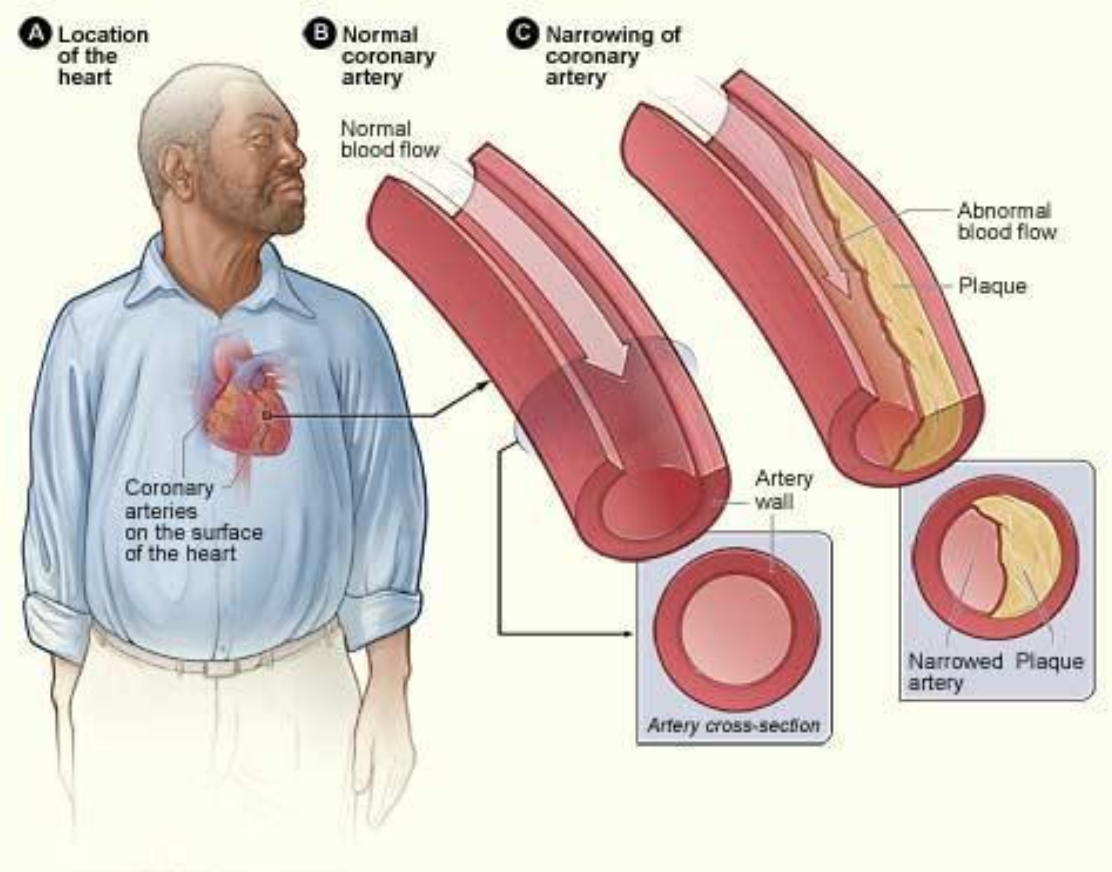


Cardiovascular Disease (Heart Disease)

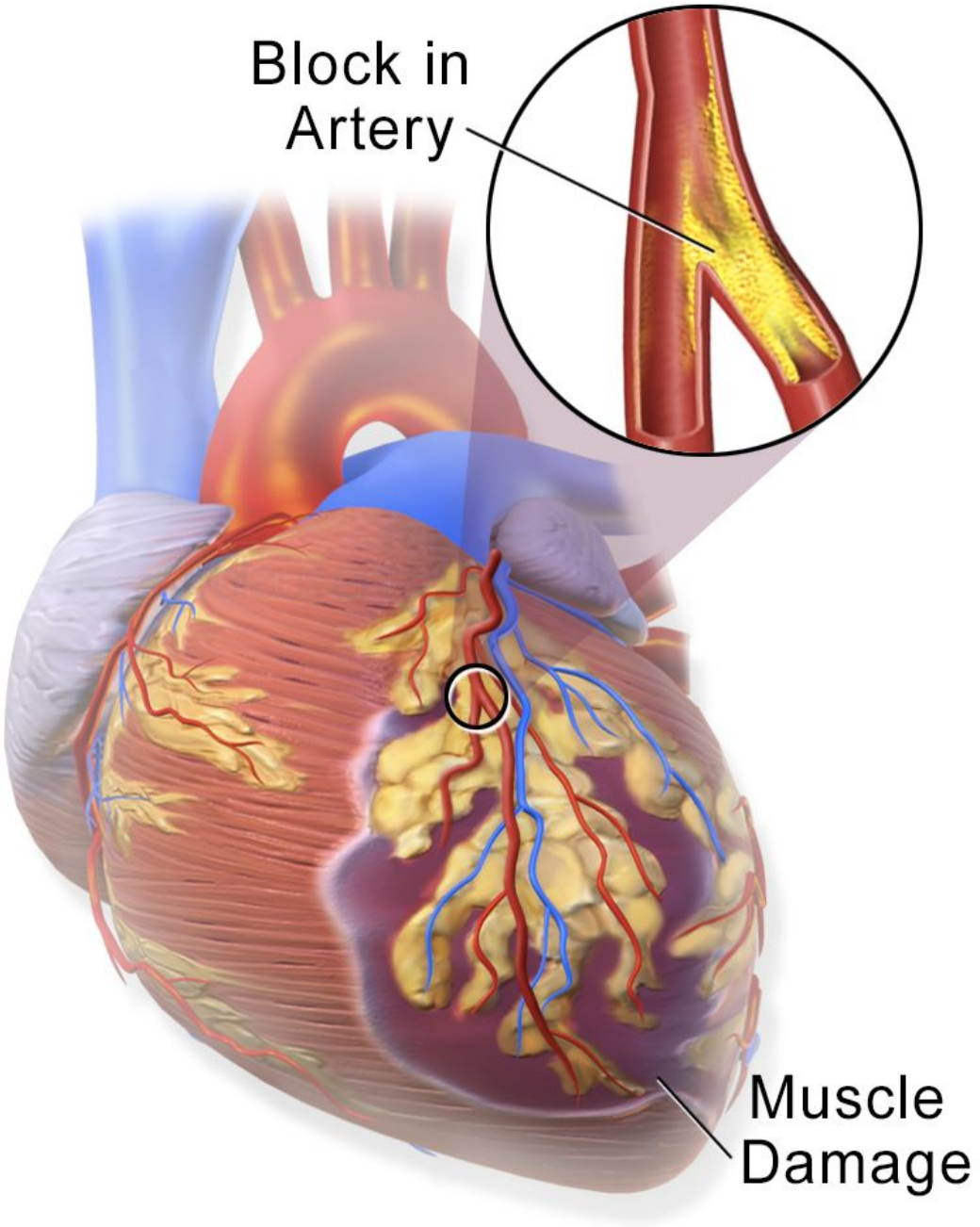
Coronary Artery Disease (CAD)



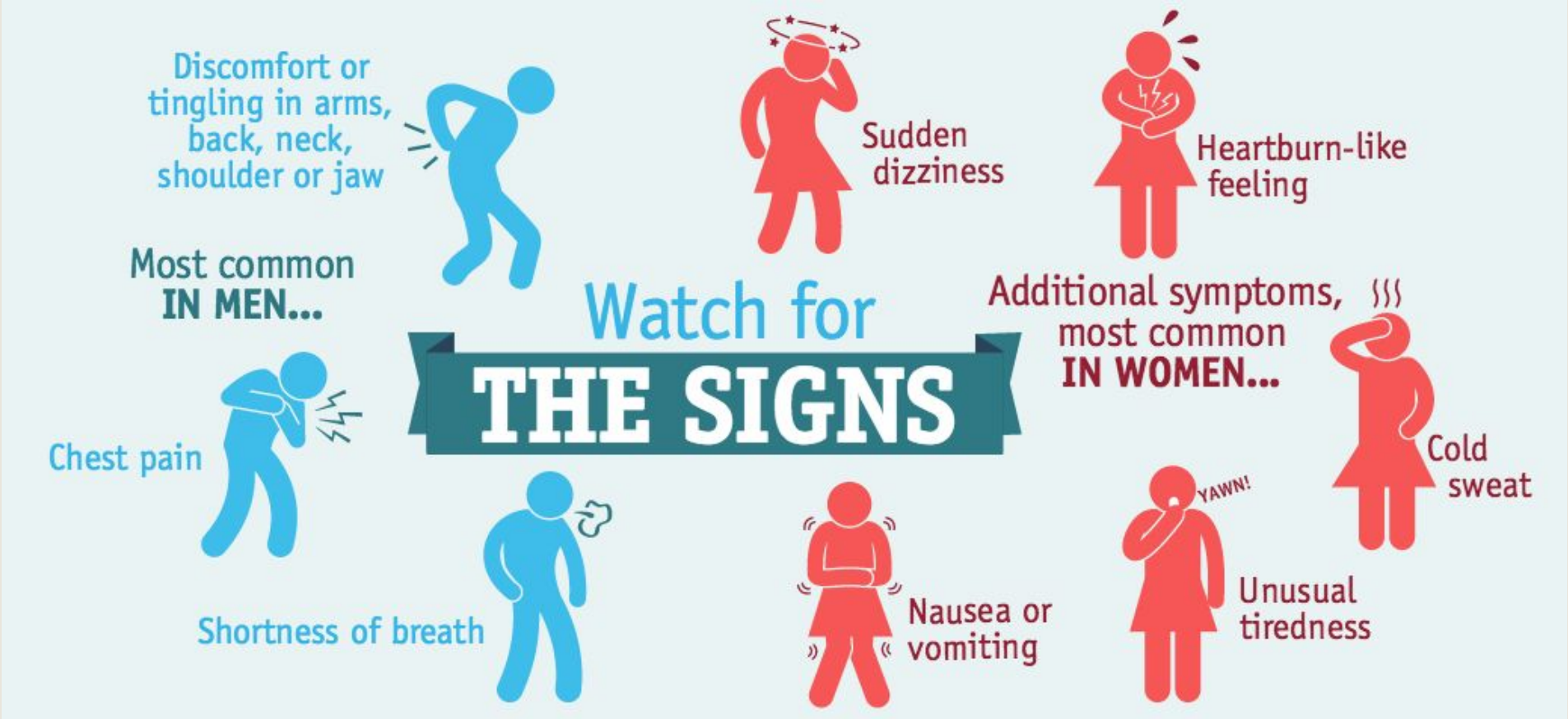
- Plaque build-up (atherosclerosis) in the walls of the arteries supplying the heart (the coronary arteries)
- Most common type of heart disease
- Often due to high cholesterol

Myocardial Infarction (Heart Attack)

- When blood flow to a portion of the heart decreases or is blocked, the heart is not getting the oxygen it needs to work properly
    - Leads to damage to the cardiac muscle
    - Ischemia = blocking of blood flow to an organ
- Commonly caused by Coronary artery disease (CAD)
- Can lead to:
    - Arrythmia: irregular heart beating
    - Cardiac arrest: **acutely** the heart fails to pump blood effectively stopping the flow of blood systemically (often fatal)
    - Congestive heart failure: **chronically** the heart fails to pump blood sufficiently such that blood flow to body tissues does not meet metabolic need



Symptoms:
Men vs. Women

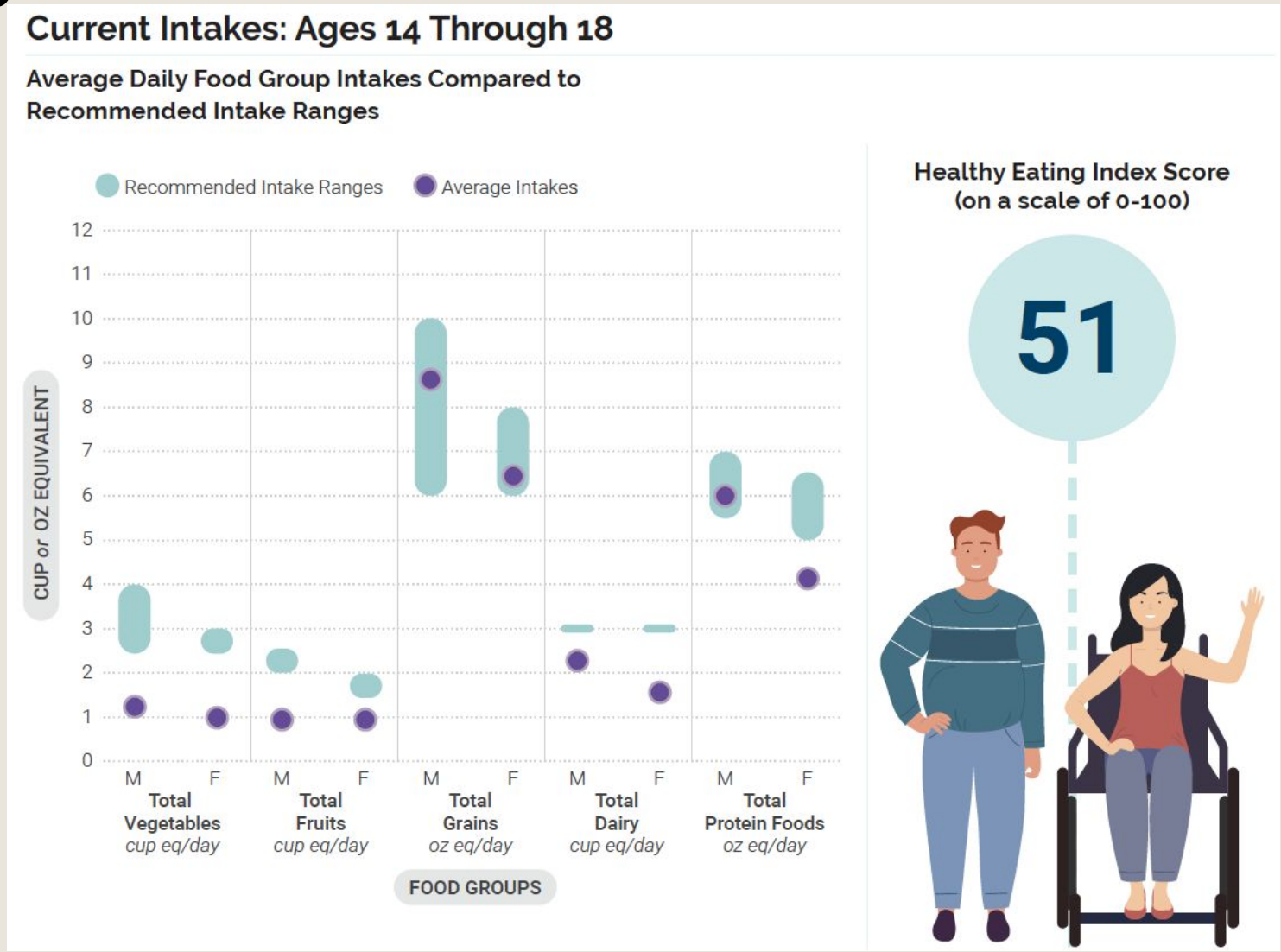


Healthy Living

Major Food Groups

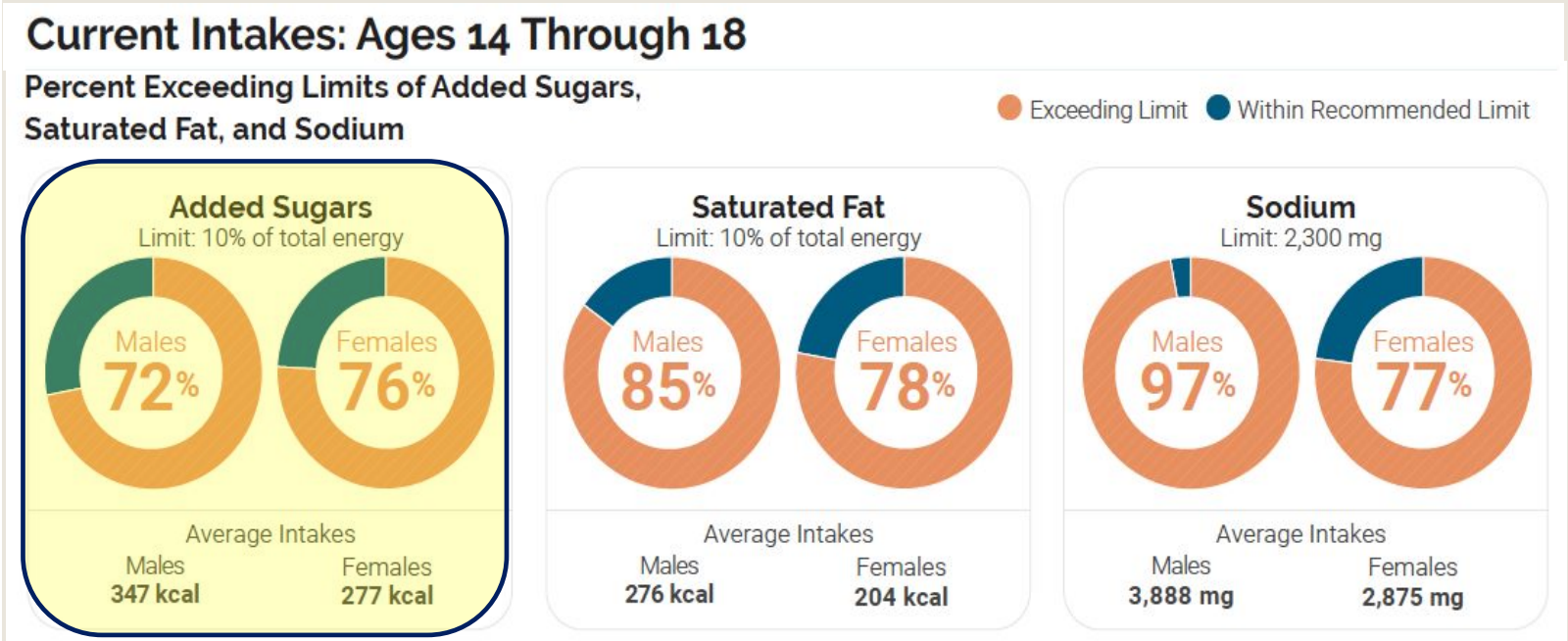
- Fruits
- Vegetables
- Grains
- Protein
- Dairy

Note in the chart:
Daily intake of vegetables, fruits, and dairy is deficient for 14-18 year olds



Limit Intake of:

- On average Americans overconsume:
  1. **Sugar**
  2. Saturated fat
  3. Sodium



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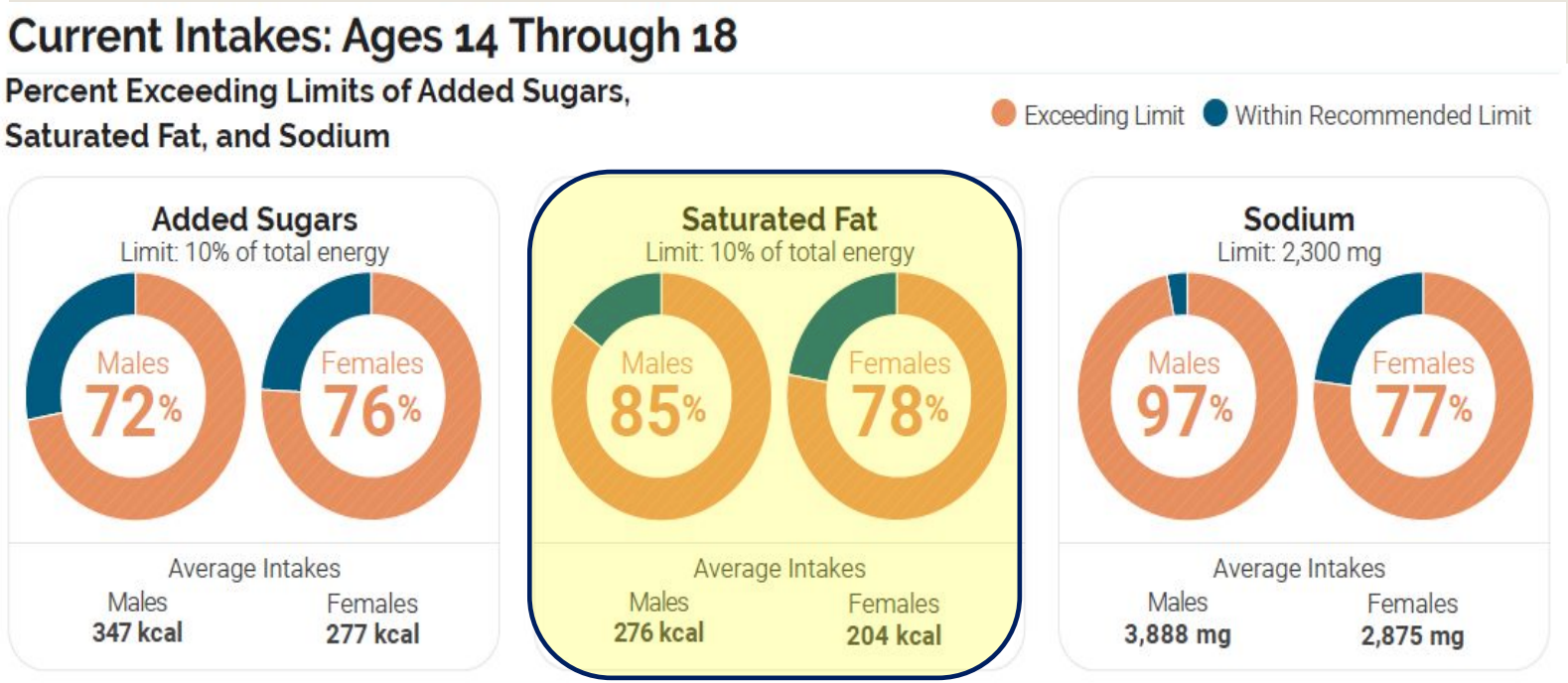

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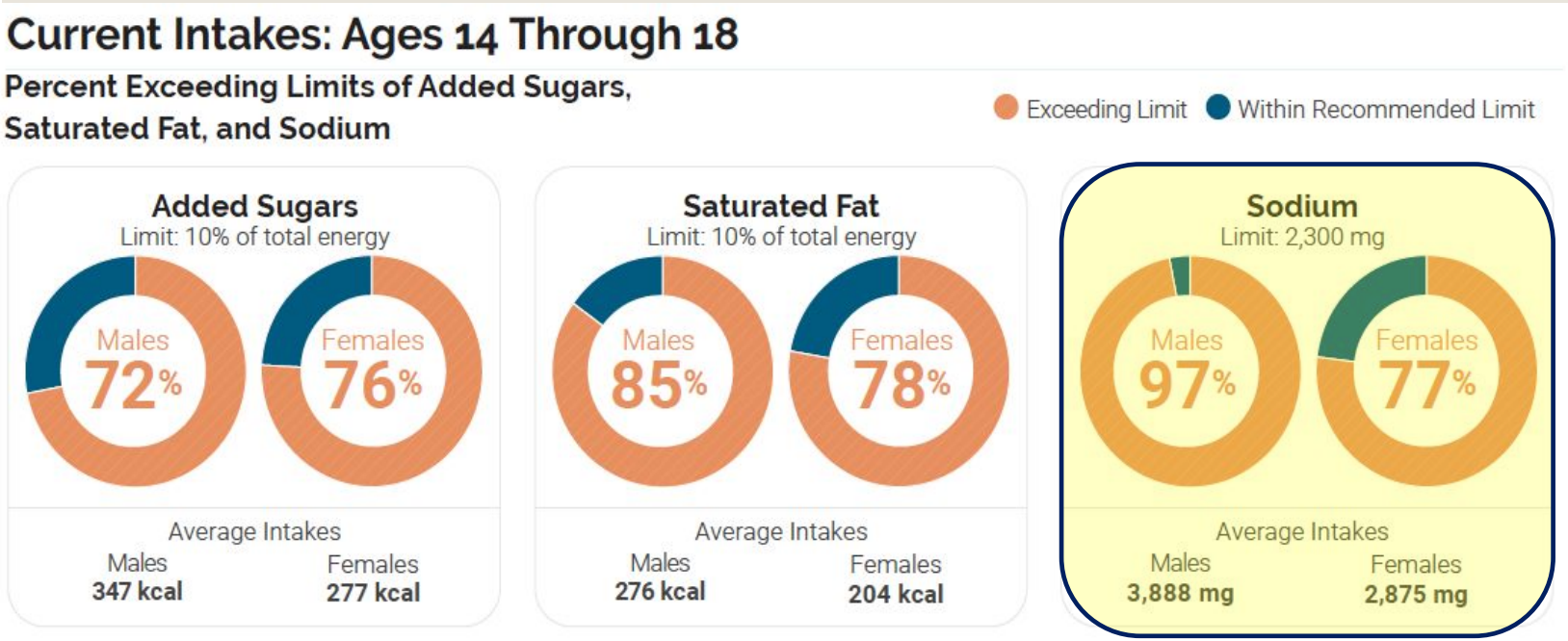
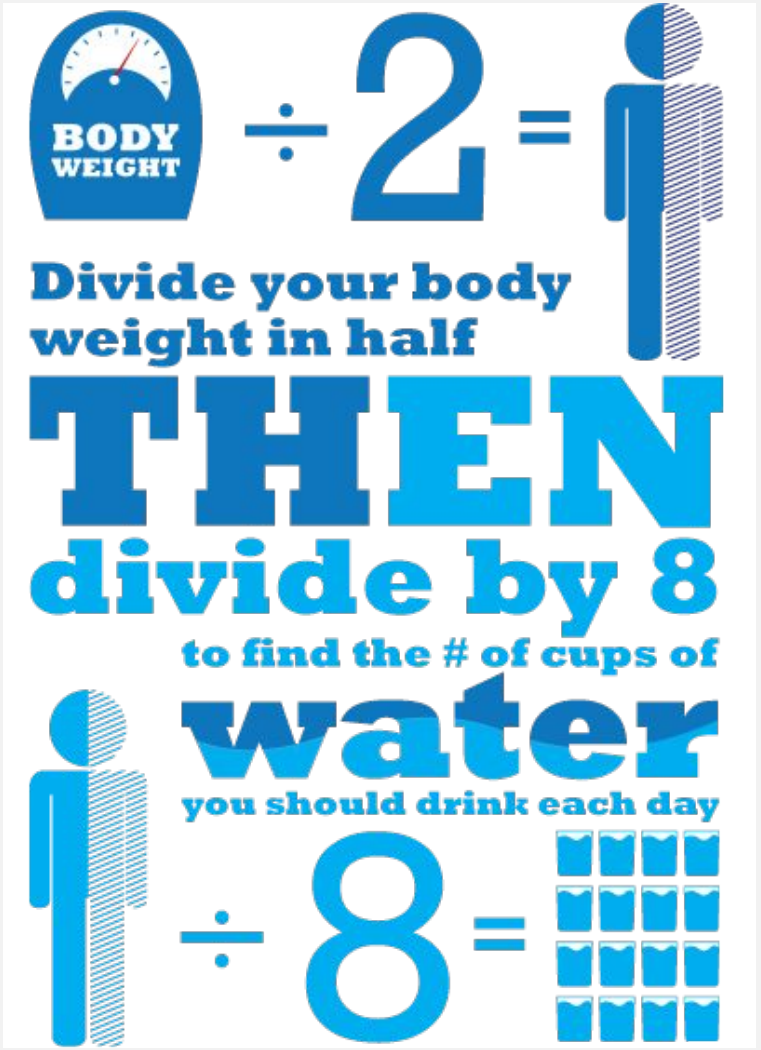


How much water should the average teen drink daily?

A. 1 cup is more than enough
B. 2-3 cups
C. 5-7 cups
D. 8-11 cups
E. 15-18 cups



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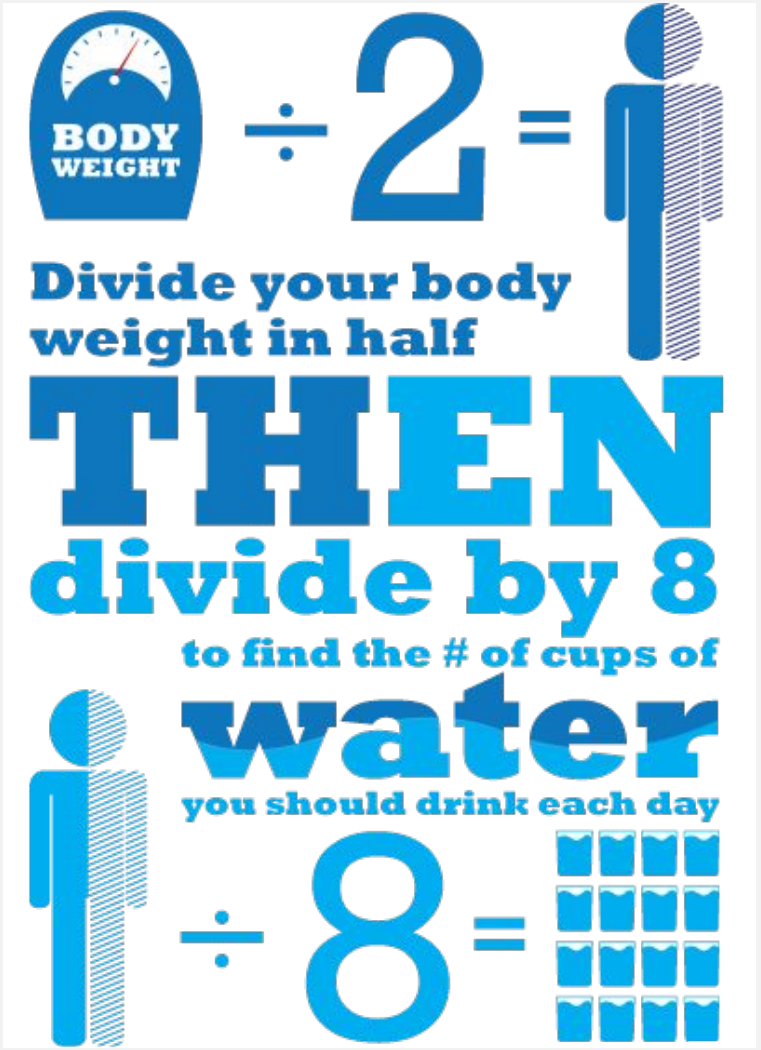

Weight Loss Diets

- The one and only way to lose weight is to operate at a "**caloric deficit**"
    - Caloric Deficit = (energy consumed) – (energy burned)
- Many popular diets highlight or feature the use of some biochemical principle (like the "keto diet" which forces the body to use molecules called ketones rather than stored glucose for energy). But no matter the biochemical principle, if weight loss occurs it is because of a caloric deficit.
- Make sure to check with a doctor or dietician before trying a new diet. Be wary of diets that force your body into some abnormal physical or chemical state

Diet name	Short description	How it works
Low carb	Eat fewer carbs and more foods rich in protein and fats	By creating a caloric deficit
Ketogenic	Eat almost no carbs, some protein and mostly fats	By creating a caloric deficit
Paleo	Eat only minimally processed "paleolythic " foods	By creating a caloric deficit
Low fat	Avoid foods high in fats and eat mostly protein and carbs	By creating a caloric deficit
Intermittent fasting	Restrict your eating period to only a few hours every day	By creating a caloric deficit
Weight watchers	Points based system to help with portion control	By creating a caloric deficit
Very Low Calorie Diet	Eat all nutrients but limit energy intake to 800 kcal	By creating a caloric deficit
Juice diet	Consume only fruit and vegetable juices while abstaining from solid food consumption	By creating a caloric deficit
Raw food diet	Eat raw foods only	By creating a caloric deficit

All these behaviors are critical in the process of losing weight except for _____?

A. Detox cleanses
B. Increasing daily activity
C. Eating at a caloric deficit
D. Adequate amounts of sleep
E. Managing stress levels

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Organic Foods

- Organic foods are produced without:
  - Chemical fertilizers
  - Synthetic pesticides (use natural pesticides instead)
  - Genetically modified organisms (GMOs)
  - Chemical food additives
  - Artificial growth hormones/ Antibiotics

From a purely nutritional standpoint, there is not enough evidence to say that organic foods provide better nutrition than conventional foods

- Studies have yet to definitively prove any clear, clinically relevant nutritional differences between organic and conventional food.
- However, there are other reasons why someone might choose to eat organic foods. For example:
  - Lower levels of detectable pesticides in organic food (but levels in conventional foods are low to begin with)
  - More humane/natural conditions for farm animals

Which of the following is the equation to determine caloric deficit?

A. Caloric deficit = (energy consumed) - (energy burned)

B. Caloric deficit = $(\text{energy burned})^2$

C. Caloric deficit = (energy burned) – (energy consumed)

D. Caloric deficit = (mass)x$(\text{speed of light})^2$

E. Caloric Deficit = (distance)/(time)

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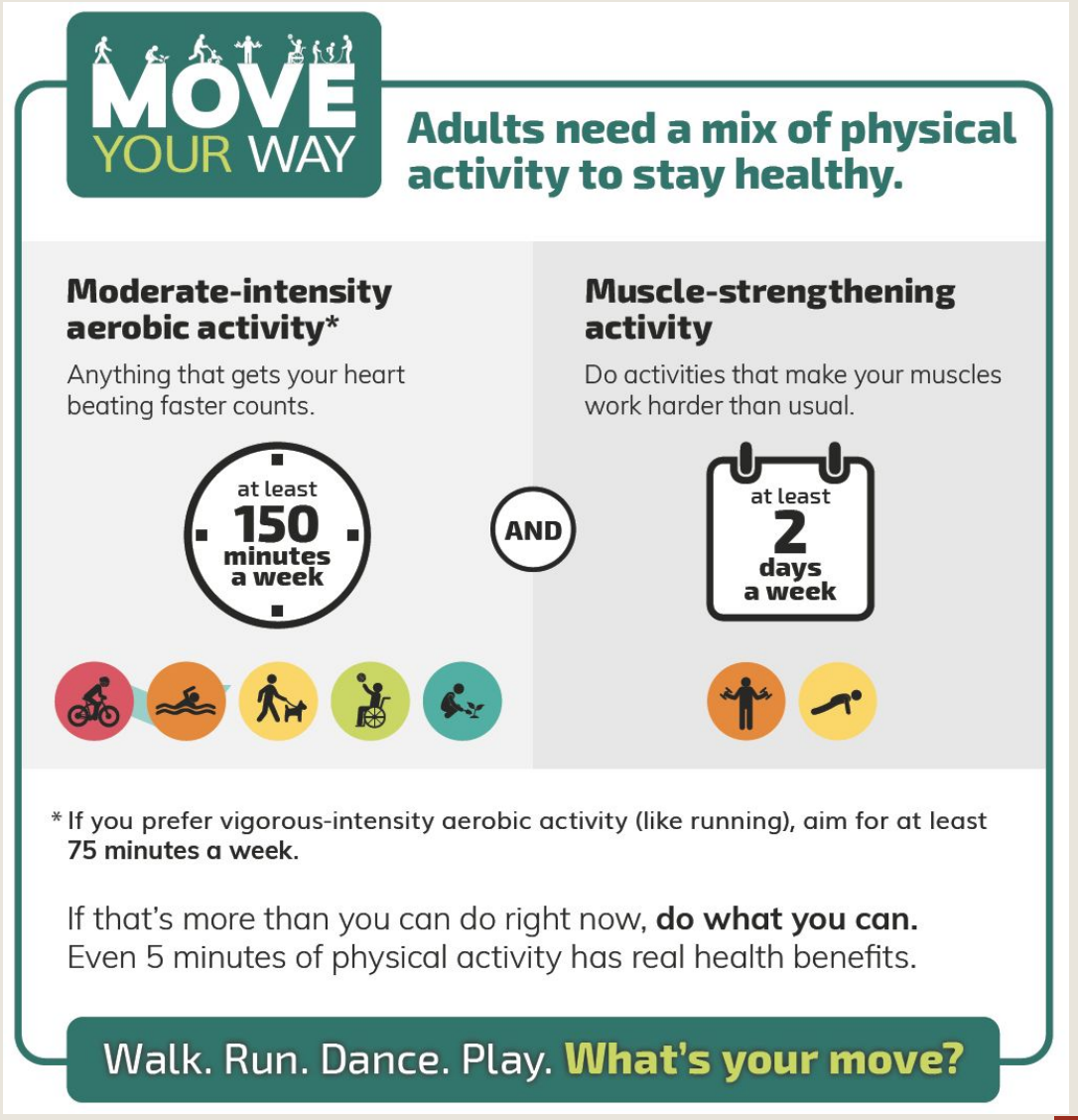
Genetically Modified Organism (GMO)

- GMO: a plant, animal, or microorganism that has had its genetic material (DNA) changed using technology that generally involves the specific modification of DNA.

- Commonly added traits:
  - Herbicide tolerance
  - Insect resistance
  - Drought tolerance
  - Prevent browning
  - Reduce natural toxins
    - Ex. Acrylamide is a natural chemical in potatoes with neurotoxic and carcinogenic potential, so we use genetic modification to reduce acrylamide production in the potatoes, so they are safe to eat.

Benefits of Aerobic Exercise

- Strengthens the heart muscle
- Aids in maintaining a healthy weight
- Increases blood flow systemically
- Decreases risk of developing heart disease
- Endorphins are release that improve mood



Which is the best form of exercise?

A. Running

B. High Intensity Interval Training (HIIT)

C. Weight training

D. There are too many factors to determine a “best” exercise

E. Dancing

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