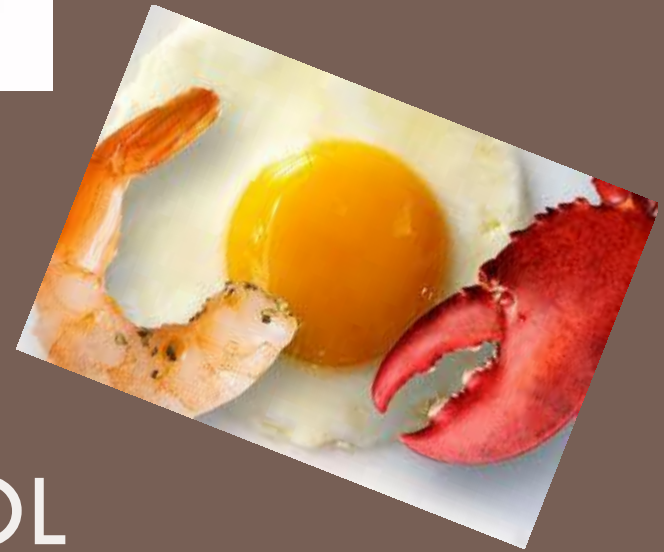
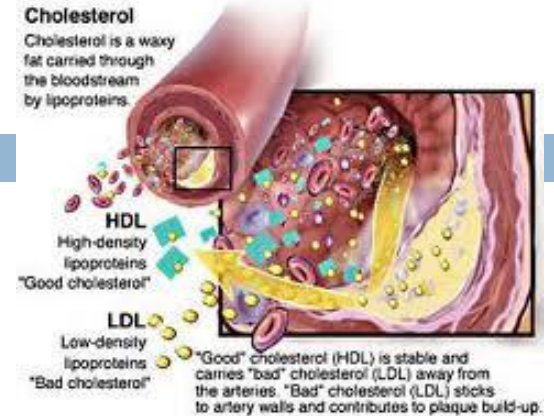


# STEROLS: CHOLESTEROL



# What is cholesterol?



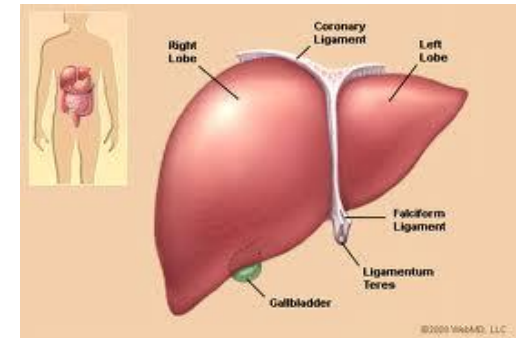
## Cholesterol:

- **A soft waxy substance made naturally in our bodies**
- **Rigid molecule that helps solidify cell walls**
  - **Up to 25% of wall is cholesterol**
  - **Insoluble in water**
- **It helps to form or repair cell membranes, some hormones, vitamin D and other tissues.**

# Where does it comes from?

The two sources of cholesterol are the

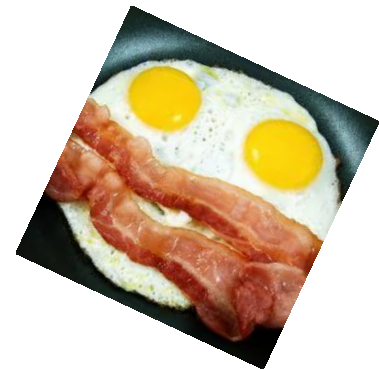
1. Liver
2. Food



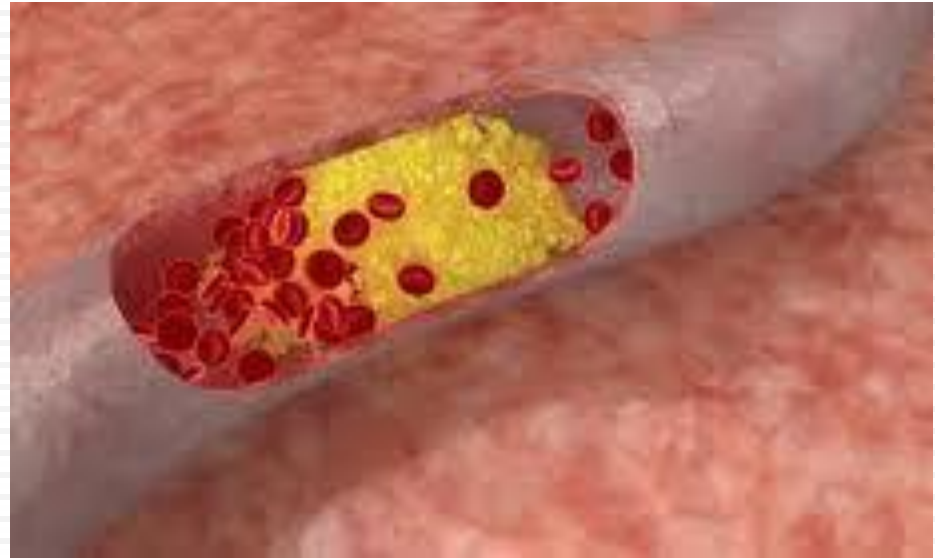
The body produces 80% of the cholesterol it needs.

- Manufactured by the **liver**

The remaining 20% comes from the **food** we eat.

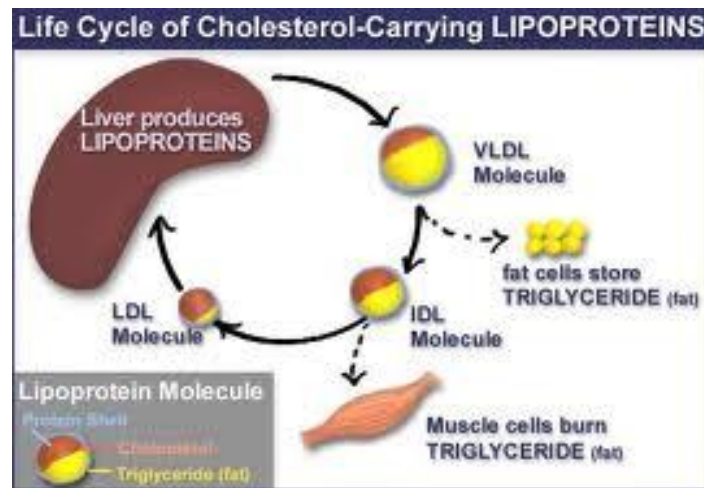


# Why is management of cholesterol important?



# Research has shown:

- There is a relationship between high blood cholesterol levels and heart disease.
- Cholesterol is transported throughout the body by **LIPOPROTEINS**
  - ▣ Clusters of lipid & protein molecules



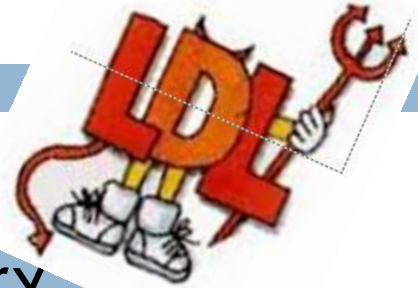
# HDL: High-Density Lipoprotein



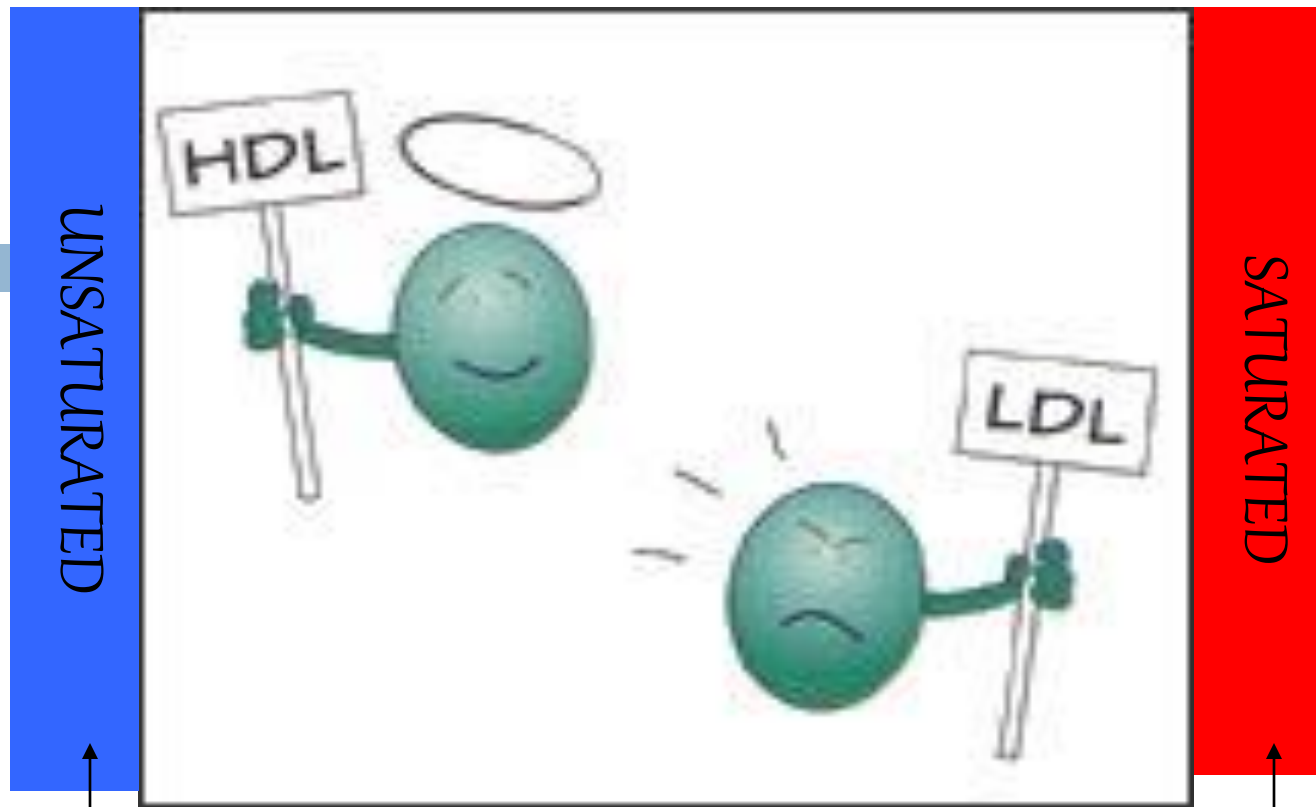
**High-density lipoproteins (HDL)** carry cholesterol from the blood back to the liver, which processes the cholesterol for elimination from the body.

- HDL makes it less likely that excess cholesterol in the blood will be deposited in the coronary arteries
- HDL cholesterol is often known as the "good" cholesterol.

# LDL: Low-Density Lipoprotein



- **Low-density lipoproteins (LDL)** carry cholesterol from the liver to the rest of the body
- When there is too much LDL cholesterol in the blood, it can be deposited on the walls of the coronary arteries.
- LDL cholesterol is often known as the "bad" cholesterol.



## Lowers blood cholesterol levels

- If there is at least one double carbon-to-carbon bond, the fatty acid is unsaturated.

- Monounsaturated - A fatty acid with one double bond is monounsaturated

**Ex: olive oil**

- Polyunsaturated - A fatty acid with two or more double bonds.

**Ex: corn oil, soybean oil**

## Raises blood cholesterol levels

- When all the bonds between the carbons are single, the fatty acid is saturated.

**Ex: Coconut & palm oil, butter, bacon, eggs, sour cream, aged cheeses, whole milk**

- Diets high in saturated fat and cholesterol reduce the liver's demand for circulating LDL, resulting in higher blood levels and greater deposition of cholesterol in vessels.

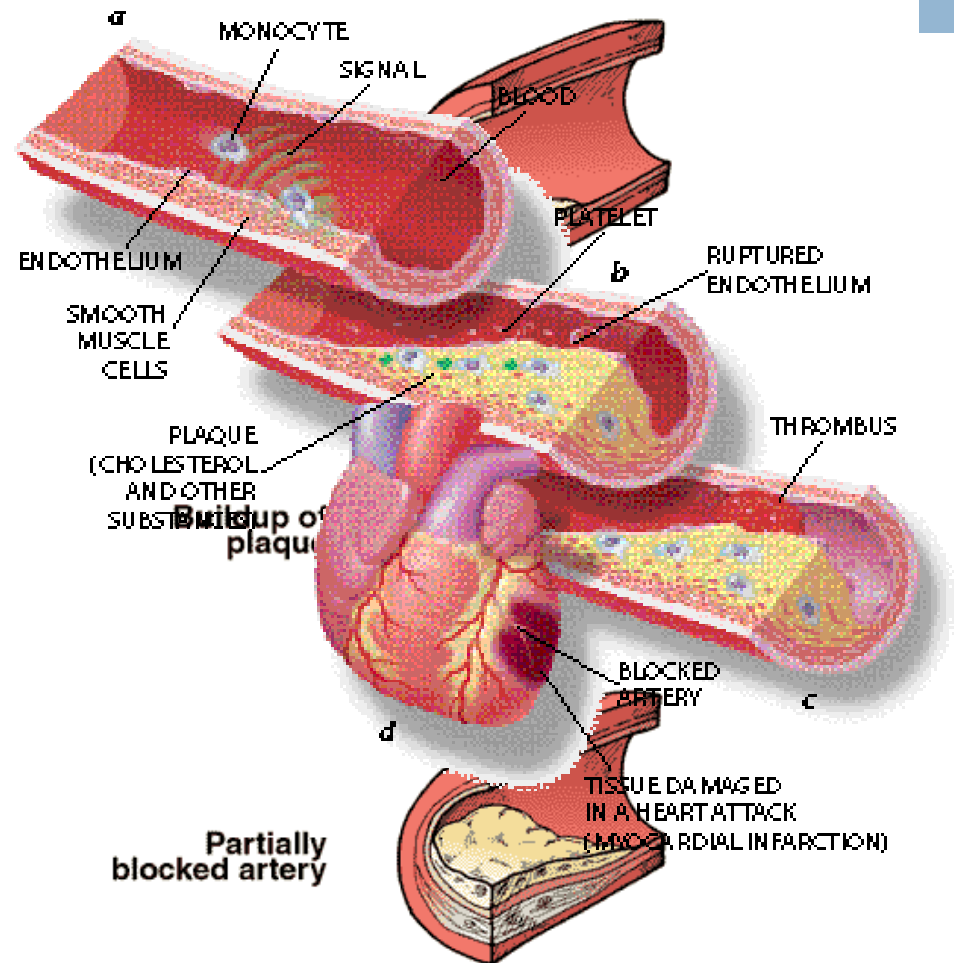
- Animal fats tend to be higher in saturated fatty acids.



## Plaque:

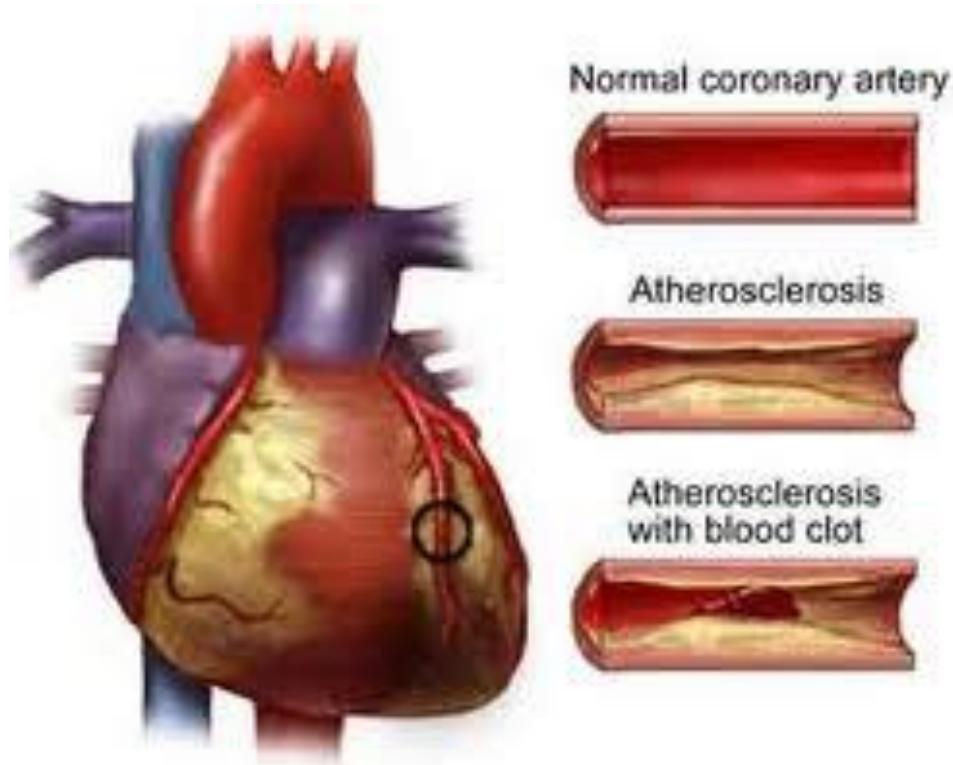
- Deposits of LDL cholesterol can build up inside arteries
- Can narrow an artery enough to slow or block blood flow.

## Plaque Buildup in Arteries



# Atherosclerosis

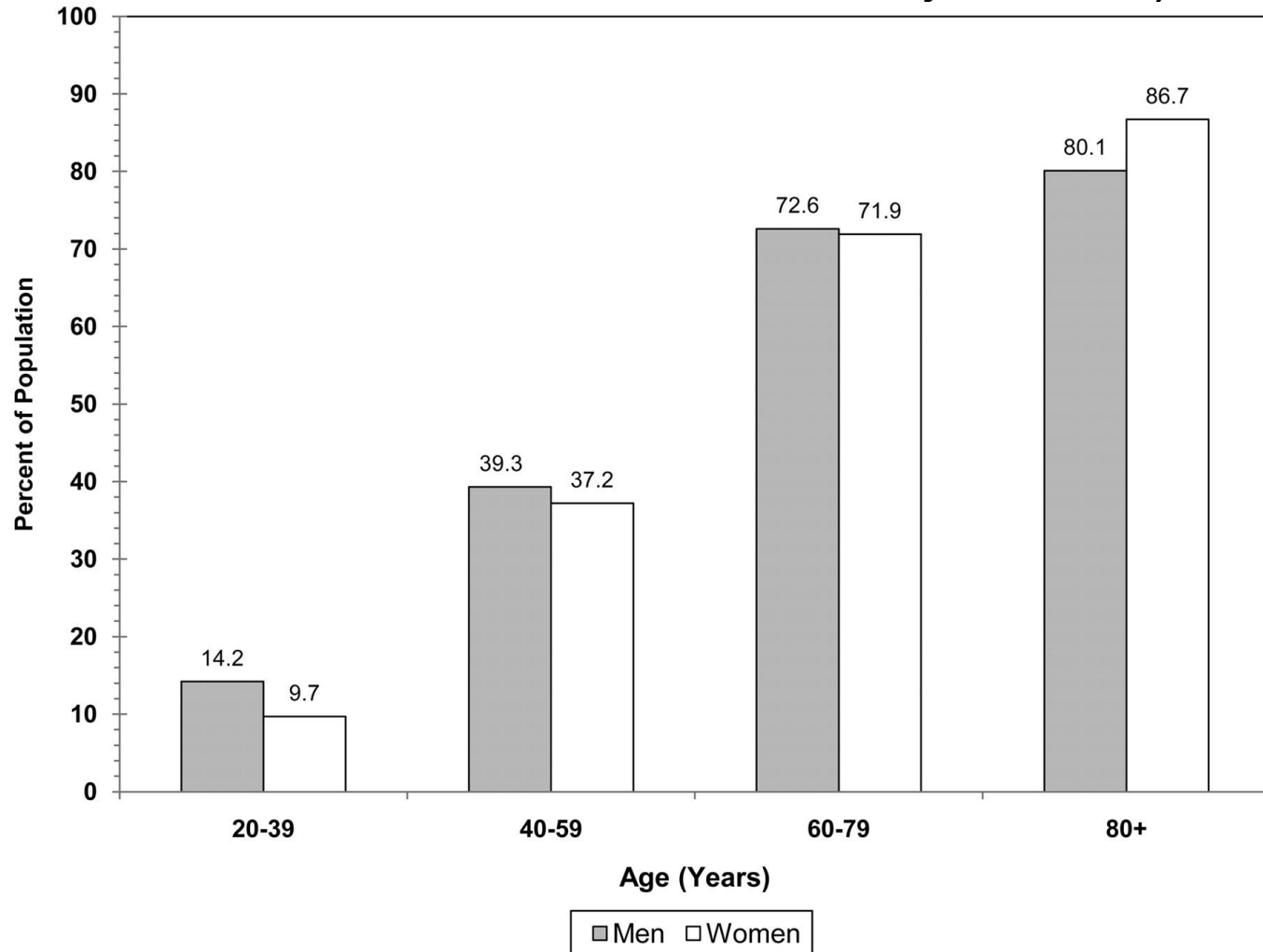
- Hardening and narrowing of the arteries is known as the heart disease, atherosclerosis



Who is in greater DANGER?

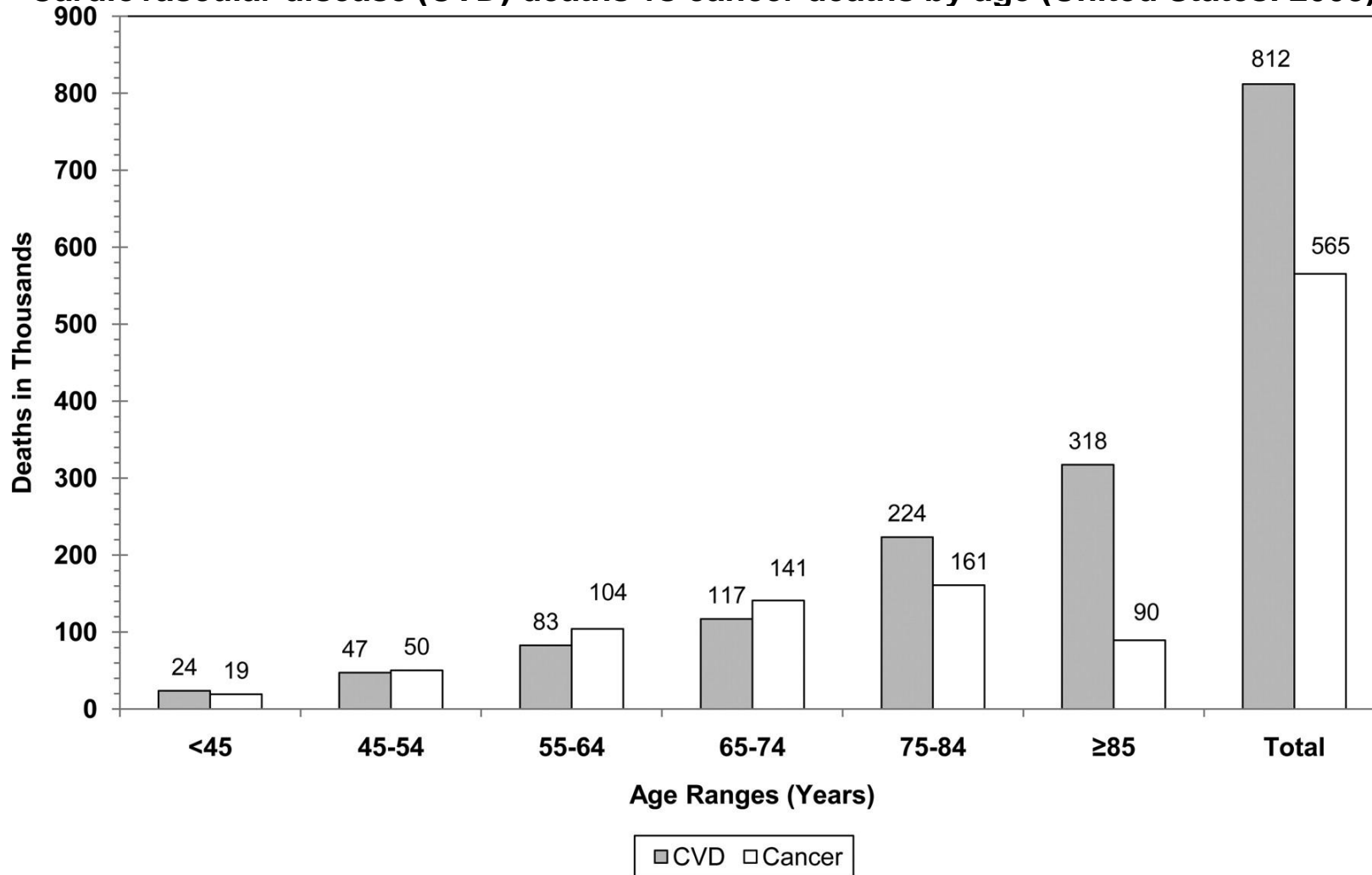


# Prevalence of cardiovascular disease in adults $\geq 20$ years of age by age and sex (National Health and Nutrition Examination Survey: 2005–2008).



Writing Group Members et al. *Circulation* 2012;125:e2-e220

### Cardiovascular disease (CVD) deaths vs cancer deaths by age (United States: 2008).



Writing Group Members et al. *Circulation* 2012;125:e2-e220



# Factors Affecting Cholesterol

## Controllable

- **Diet.**
  - Saturated fat and cholesterol in the food you eat increase cholesterol levels. Try to reduce the amount of saturated fat and cholesterol in your diet.
- **Weight.**
  - In addition to being a risk factor for heart disease, being overweight can also increase cholesterol. Losing weight can help lower your LDL and total cholesterol levels, as well as increase HDL cholesterol.
- **Exercise.**
  - Regular exercise can lower LDL cholesterol and raise HDL cholesterol. You should try to be physically active for at least 30 minutes on most days.

## Uncontrollable

- **Age and Gender.**
  - As we get older, cholesterol levels rise. Before menopause, women tend to have lower total cholesterol levels than men of the same age. After menopause, however, women's LDL levels tend to rise.
- **Diabetes.**
  - Poorly controlled diabetes increases cholesterol levels. With improvements in control, cholesterol levels can fall.
- **Heredity.**
  - Your genes partly determine how much cholesterol the body makes.
- **Other causes.**
  - Certain medications and medical conditions

# Fats and Oils to Choose

Use this handy graph to help you choose products with the least amount of saturated fat (look for the ♥).

Heart disease is low among Mediterranean regions:



**OLIVE OIL**  
(high in **unsaturated fatty acids**)

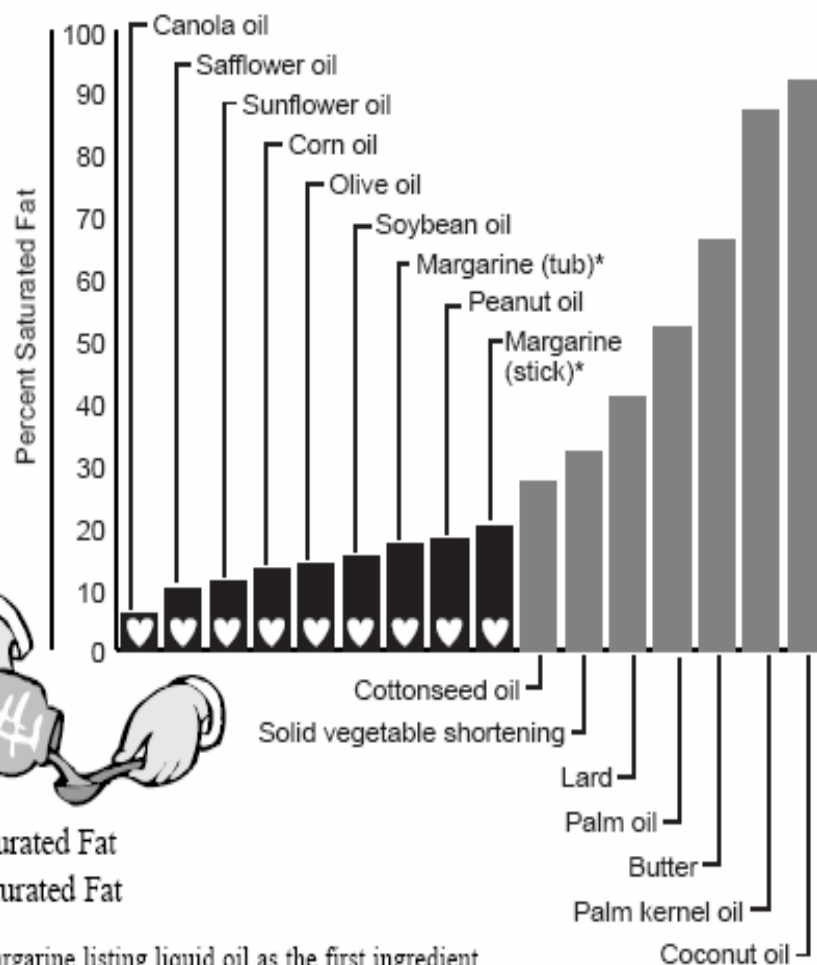
## Polyunsaturated:

Lower LDL but may also  
Lower HDL

## Monounsaturated:

Lower LDL without lowering  
HDL

• **CANOLA AND OLIVE OIL**



- Lower in Saturated Fat
- Higher in Saturated Fat

\* An average of margarine listing liquid oil as the first ingredient.

# Trans FAT

- Increases LDL or bad cholesterol

- Required to be on nutrition labels
- Typically found in foods that are fried or that contain margarine or shortening.
  - Ex.: Snack crackers, donuts, chips, chocolate chip cookies, taco shells, muffin mix, and margarine.
- Reducing overall dietary fat is the best way to reduce intake of trans fatty acids.
- Reducing reliance on shortening and margarine also is beneficial

<b>Nutrition Facts</b>			
Serving Size 1 cup (228g)			
Servings Per Container 2			
Amount Per Serving			
<b>Calories</b> 260	Calories from Fat 120		
<b>% Daily Value*</b>			
<b>Total Fat</b> 13g			<b>20%</b>
Saturated Fat 5g			<b>25%</b>
Trans Fat 2g			
<b>Cholesterol</b> 30mg			<b>10%</b>
<b>Sodium</b> 660mg			<b>28%</b>
<b>Total Carbohydrate</b> 31g			<b>10%</b>
Dietary Fiber 0g			<b>0%</b>
Sugars 5g			
<b>Protein</b> 5g			
Vitamin A 4%	•	Vitamin C 2%	
Calcium 15%	•	Iron 4%	
* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs:			
	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g
Calories per gram:			
Fat 9	•	Carbohydrate 4	• Protein 4



# Expand & Check Your Knowledge:

## *Lipids Review Assignment*

- Cholesterol  
[http://www.medicinenet.com/cholesterol\\_levels\\_pictures\\_slideshow/article.htm](http://www.medicinenet.com/cholesterol_levels_pictures_slideshow/article.htm)
- Cholesterol Quiz:  
[http://www.medicinenet.com/high\\_cholesterol\\_hyperlipidemia\\_quiz/quiz.htm](http://www.medicinenet.com/high_cholesterol_hyperlipidemia_quiz/quiz.htm)
- Fat Quiz: [http://www.medicinenet.com/fat\\_and\\_fats\\_quiz/quiz.htm](http://www.medicinenet.com/fat_and_fats_quiz/quiz.htm)
- Top 5 foods:  
<http://www.mayoclinic.com/health/cholesterol/CL00002>