

M U N I

M E D

Health, disease, normality and the factros of healthy lifestyle

Health

x

Disease

Health

No - disease

X

Disease

No - health

Disease - illness – symptom - syndrom

- Disease – objectively detectable
- Illness – subjectively felt
- Sign – objective „issue“ (swelling)
- Symptom – subjective „issue“ (pain)
- Syndrome – typical cluster of signs and symptoms
- Disease
 - Asymptomatic (disease without illness/signs without symptoms)
 - Symptomatic (disease with illness)

Health

Health is a state of **complete physical, mental and social well-being and not merely the absence of disease or infirmity.**

(WHO, 1946).

Health

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(WHO, 1946).

- ✓ Physiological component – objective
- ✓ Psychological component – subjective
- Synthesis of neutral and normative concepts

Neutral and normative concepts of health/disease

- Neutral concept
 - Objective (disease)
 - Health – normal function
 - Disease – impaired function
- Normative concept
 - Subjective (illness)
 - Health – ability to achieve desired goals
 - Disease/Illness – limitations causing inability to achieve desired goals

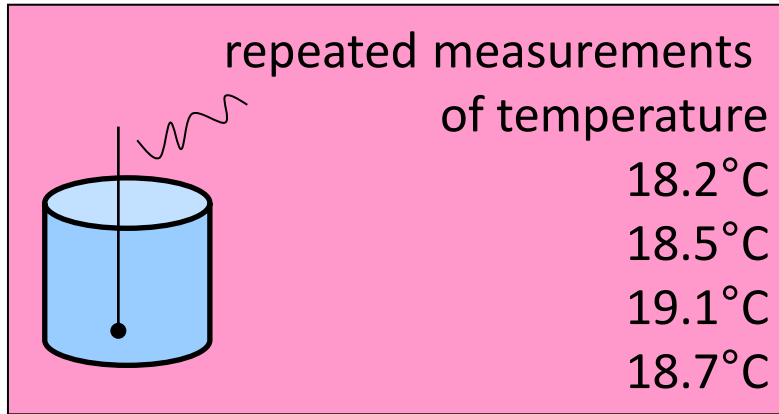
What is normal in medicine?

- Usual – NO
- Functional – YES
- Normality may be considered from medical point of view as health
- When trying to quantify, we run into the trouble with data variability

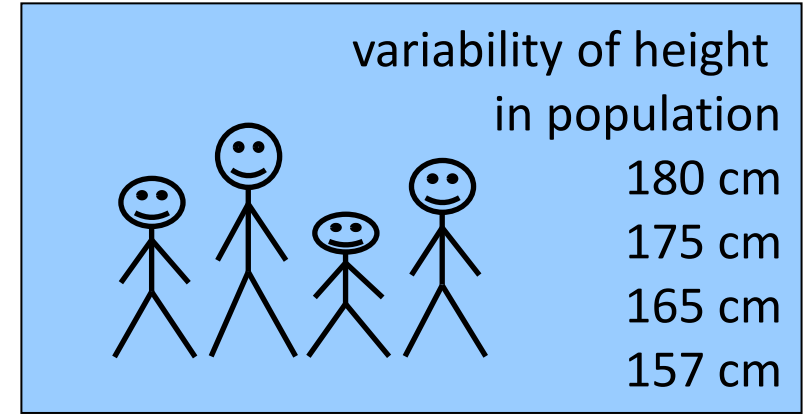
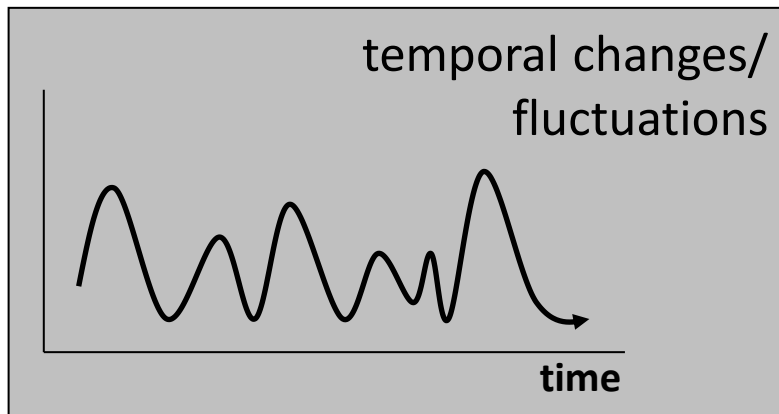
Quantitative

Qualitative

Intra and interindividual variability



diversity in biological
populations
inter-population or ethnical
differences
= **BIODIVERSITY**



Intra and interindividual variability

repeated measurements
of temperature

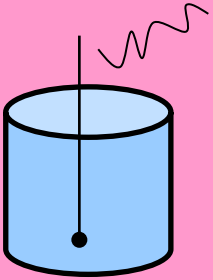
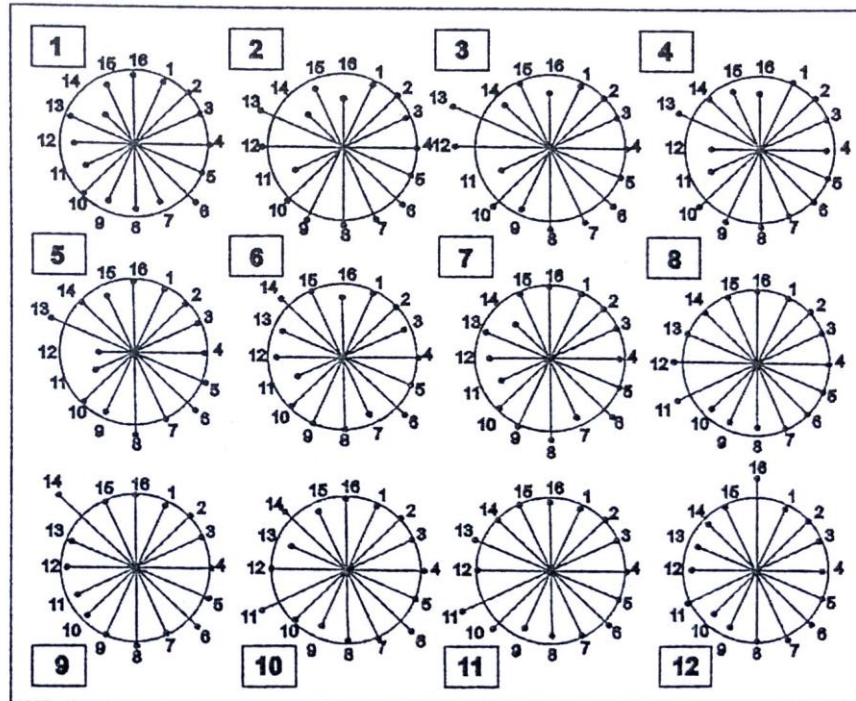


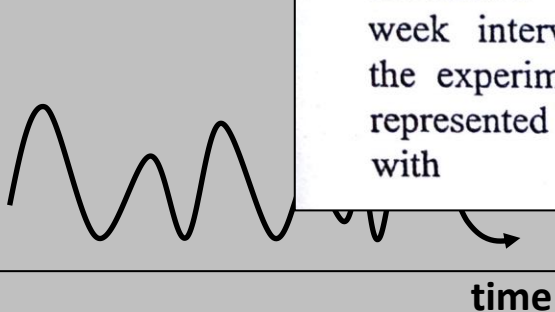
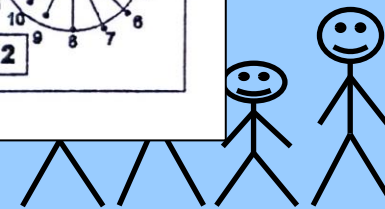
Fig. 1 “Profiles” of organ functions in healthy persons. 16 physiological features (blood pressure, heart rate, urinary excretion, creatinine clearance, osmotic clearance, urinary pH, resting and exercising pulmonary ventilation, etc.) were measured in 12 healthy men for 6 successive weeks in one-week intervals. Mean of the experimental group is represented here by a circle with a radius



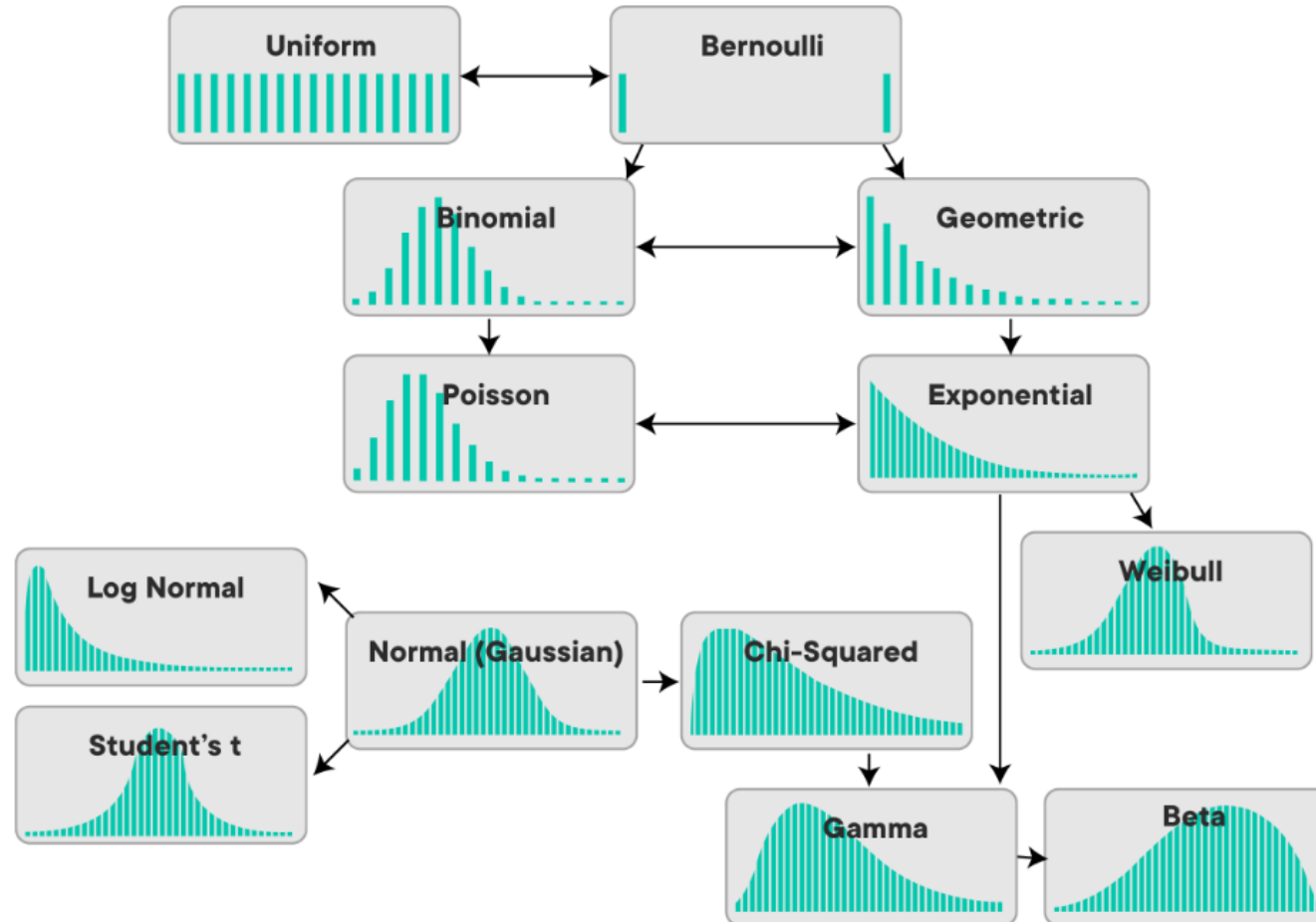
diversity in biological
populations
population or ethnical
differences
= **BIODIVERSITY**

variability of height
in population

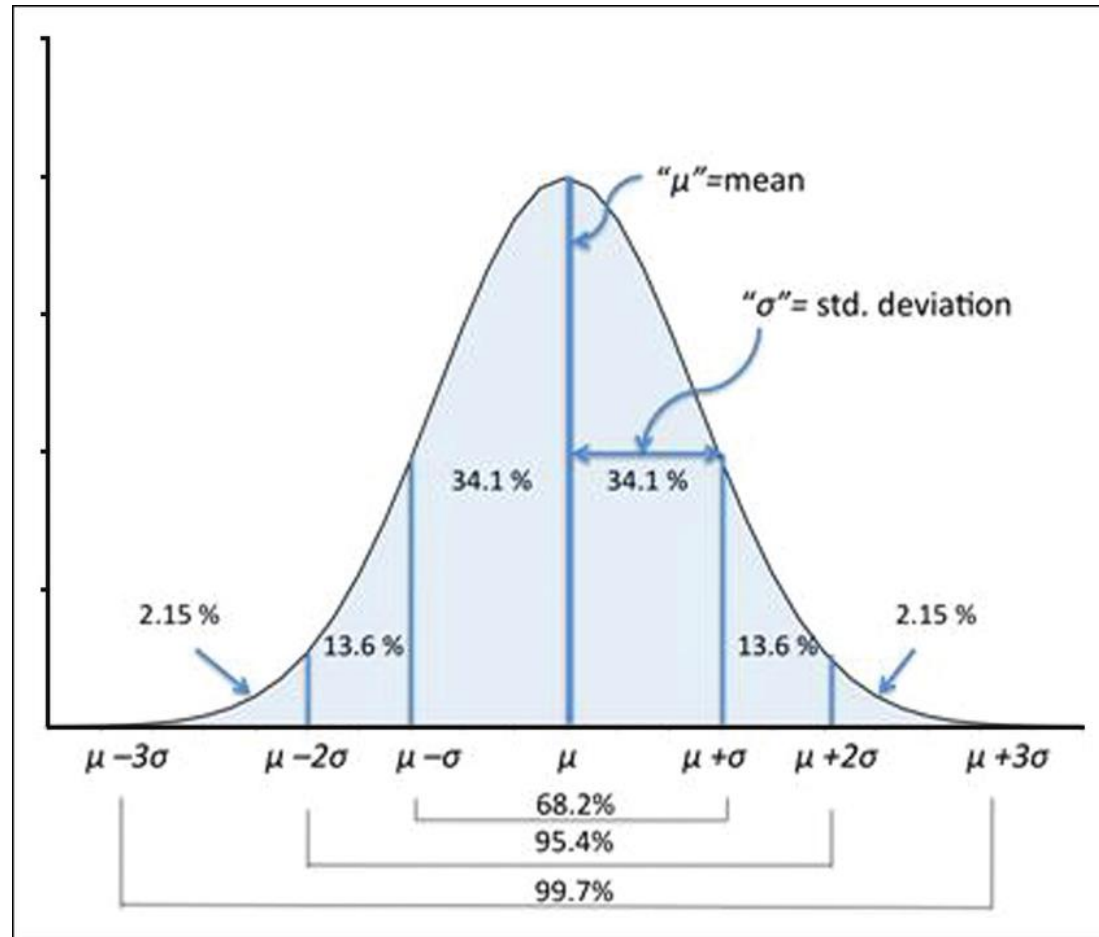
180 cm
175 cm
165 cm
157 cm



Data distribution

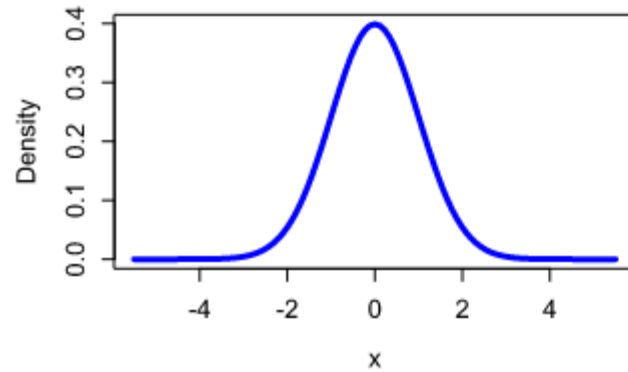


Normal data distribution

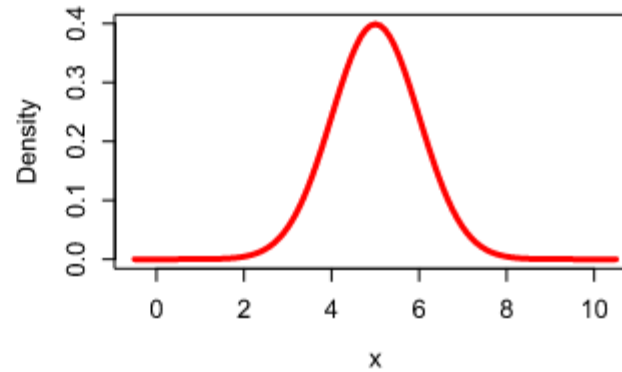


Normal data distribution

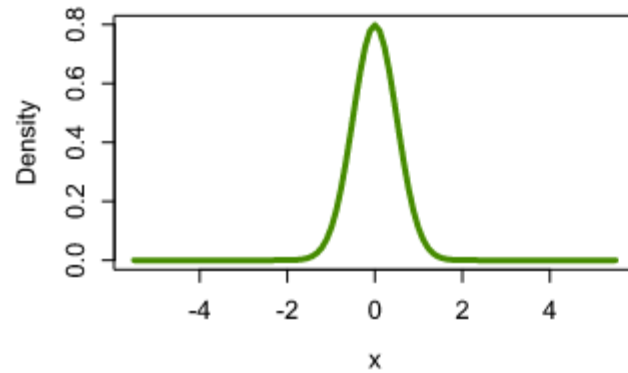
A: Standard Normal Distribution: $\mu = 0, \sigma = 1$



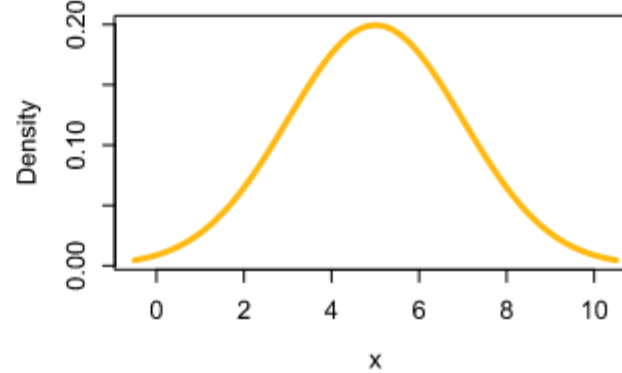
B: Normal Distribution with $\mu = 5, \sigma = 1$



C: Normal Distribution with $\mu = 0, \sigma = 0.5$



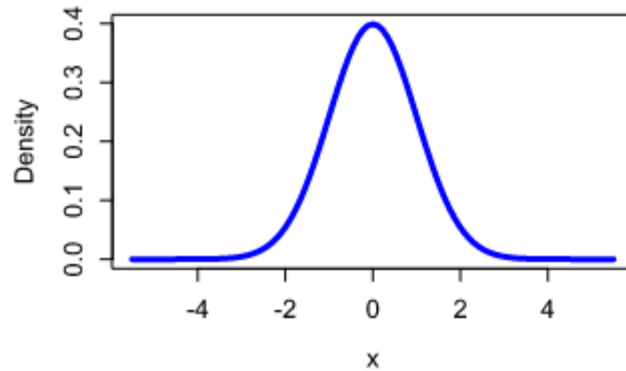
D: Normal Distribution with $\mu = 5, \sigma = 1.5$



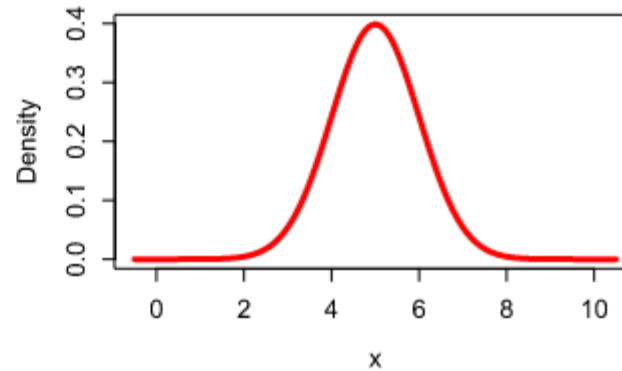
Normal data distribution

How to distinguish between usual and functional?

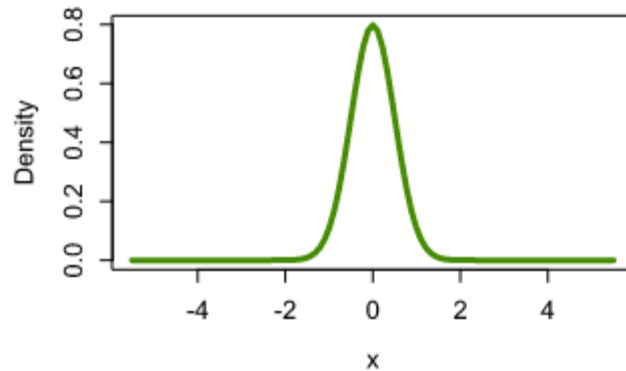
A: Standard Normal Distribution: $\mu = 0, \sigma = 1$



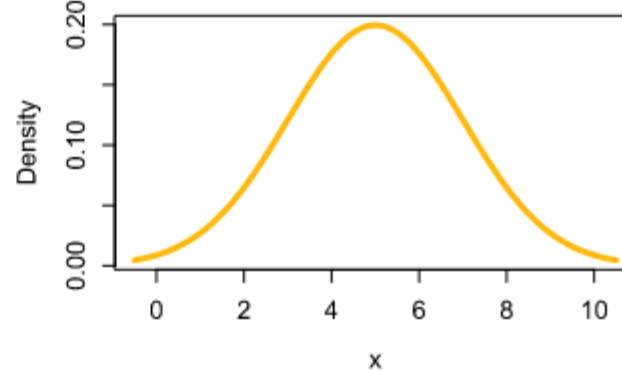
B: Normal Distribution with $\mu = 5, \sigma = 1$

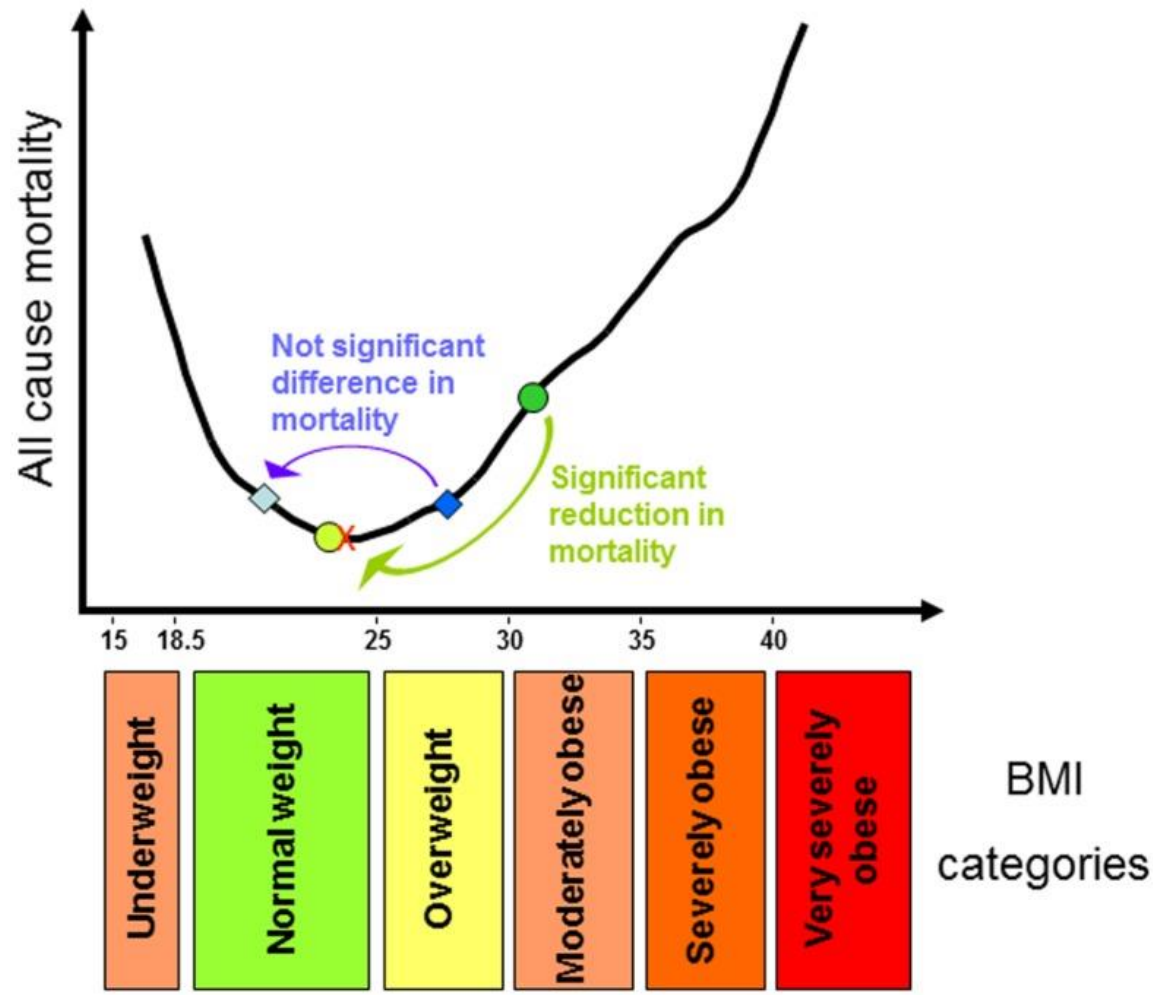


C: Normal Distribution with $\mu = 0, \sigma = 0.5$

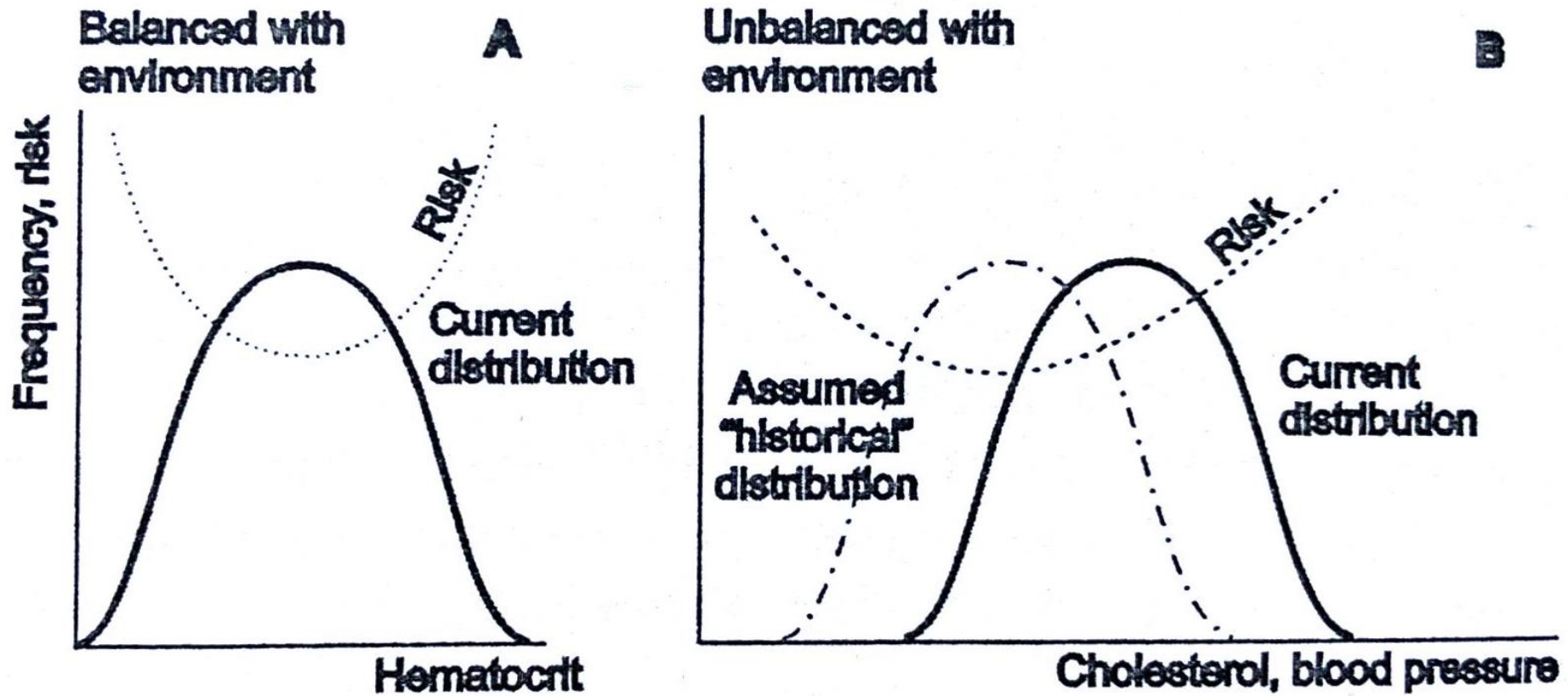


D: Normal Distribution with $\mu = 5, \sigma = 1.5$





How Much Should We Weigh for a Long and Healthy Life Span? The Need to Reconcile Caloric Restriction versus Longevity with Body Mass Index versus Mortality Data - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/U-shaped-curve-showing-the-relationship-between-all-cause-mortality-and-body-mass-index_fig1_264794803 [accessed 1 Oct, 2022]



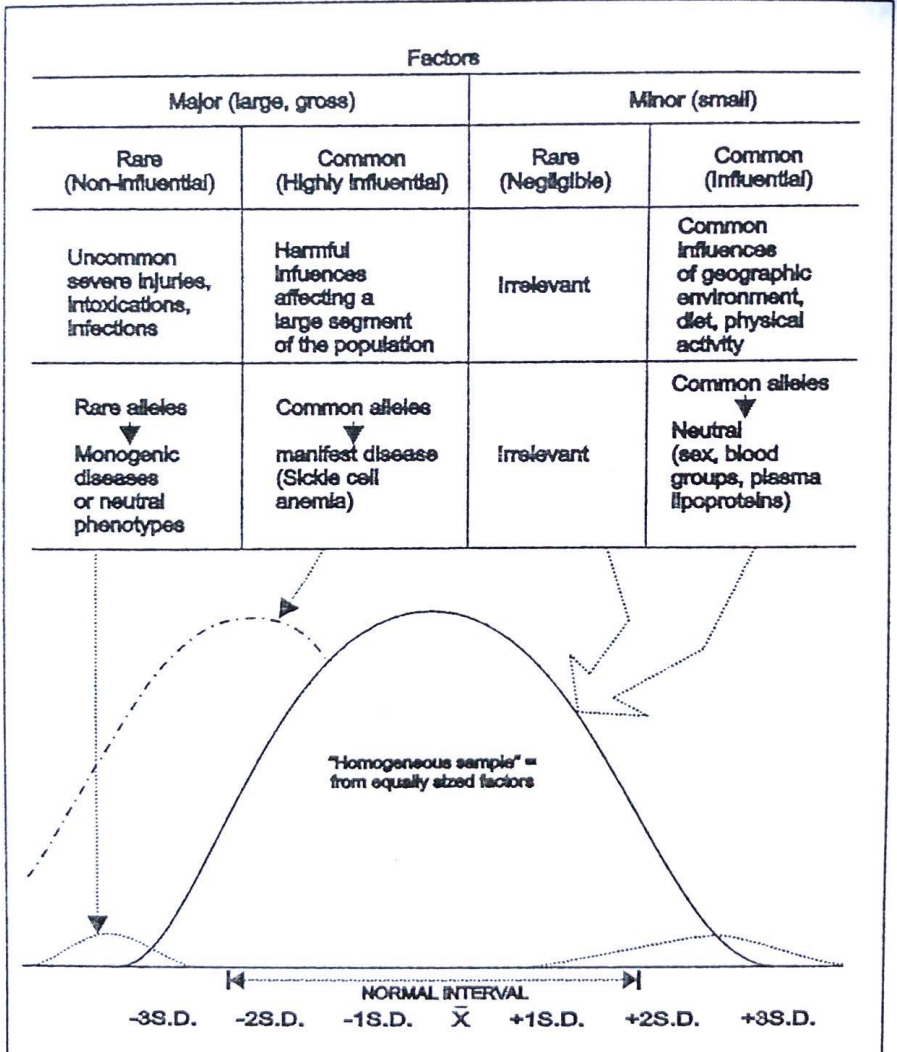
Factors influencing the disease development

Internal x Extrenal

Major x Minor

Common x Rare

**Modifiable
x
Unmodifiable**



Health and disease models

➤ **Alternative model**

- The all or nothing principle
- Influence of major factor / heterogeneous set of causes
- Focus of curative medicine

➤ **Continuous (graded) model**

- Continuous transition between health and disease
- Influence of numerous minor factors / homogenous set of causes
- Focus of preventive medicine

Factors of a healthy lifestyle

- The principle of moderation
 - Risk diversification
 - We don't have all the information and what seems healthy today may be viewed differently in the light of new knowledge in the future
- Nutrition
- Physical activity
- Sleep

Sleep

CLEAN UP YOUR SLEEP HYGIENE

13 simple tricks, will help you get a good nights sleep.



1. Go to bed and get up at the same time every day, including on the weekends and during vacations.



2. If you can't fall asleep or wake up and can't get back to sleep, get out of bed, read, sketch, or do another calming activity in low light.



3. Make sure your bedroom is quiet, dark, relaxing, and at a comfortable temperature.



4. Remove electronic devices, such as TVs, computers, and smart phones, from the bedroom.



5. Use your bed only for sleep and sex.



6. Exercise, being physically active during the day can help you fall asleep more easily and sleep more deeply at night.



7. Keep a sleep diary, experiment and figure out what works best for you.



8. Limit exposure to bright light in the evenings, turn off electronic devices at least 30-60 minutes before bedtime.



9. Establish a relaxing bedtime routine.



10. Don't eat a large meal before bedtime. If you are hungry at night, eat a light, healthy snack.



11. Avoid consuming caffeine in the late afternoon or evening.

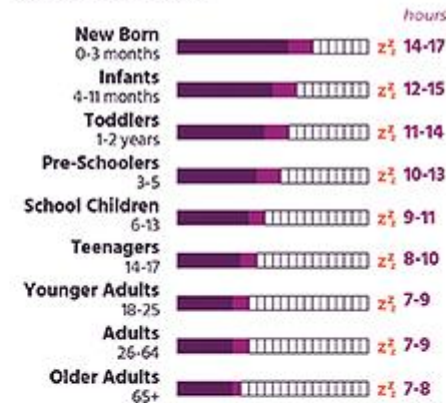


12. Avoid consuming alcohol, nicotine and THC before bedtime.



13. Reduce your fluid intake before bedtime.

WHAT'S THE RIGHT AMOUNT OF SLEEP FOR YOU?



Above are the current evidence-based recommendations for each age group, use this as a guide for how many hours of sleep you need to feel your best.



co-created by **opticnerve**
marykelley.com & alpinistastudio.com

Sleep Hygiene. Retrieved from <http://www.sleepfoundation.org/articles/sleep-hygiene>
Basics About Sleep: Tips For Better Sleep (2016, July15). Retrieved from http://www.cdc.gov/sleep/about_sleep/sleep_hygiene.html

- Sleep hygiene is the most underrated factor in a healthy lifestyle (perhaps because it has limited marketing potential)

- The need for sleep is individual, but in general we can say that we sleep less than we should

Risks associated with chronic sleep deprivation

- Cardiovascular systém
 - Mainly hypertension
- Immunity
 - ✓ Increased susceptibility to infections
- Metabolism
 - ✓ Higher risk of obesity, metabolic syndrome and DM
 - Slowing down of metabolism
 - ↓Leptin ↑Gherilin
 - ↓ insulin sensitivity and glucose tolerance
- Brain
 - ✓ Decreased cognitive performance and concentration
 - ✓ Reduced spontaneity – reduced physical activity
 - ✓ Increased appetite for calorically dense, sweet and fatty food (according to one theory, the brain interprets fatigue as a lack of energy)

✓ Sleep deprivation is one of the most powerful stressors

✓ The risks correspond to the risks associated with chronic stress

SLEEP & PERFORMANCE

The amount and quality of sleep you get impacts your performance at school, home, work, and if you're a Warfighter, during missions. Learn the facts about sleep to help you manage "sleep debt," and set yourself up for success, day and night.

- SLEEP NEED** (Icon: Alarm clock)
Most people, including Warfighters, need 7-8 hours of sleep to function optimally. Less sleep = decreased performance quality.
- DEPLOYED WARFIGHTERS** (Icon: Clock and person)
Service Members away from home report getting only about 5-6 hours of sleep per 24 hours due to night operations and poor sleep environments.
- BRAIN** (Icon: Head with brain)
In order to recover and perform complex mental operations needed for successful military operations, sleep is essential.
- SLEEP DEBT** (Icon: Stacks of coins)
If you don't get 7-8 hours of sleep every 24 hours, you build up a sleep debt. The more debt you have, the more sleep it will take to pay it off.
- PERFORMANCE** (Icon: Head with question mark)
Mental performance—such as planning ahead, solving problems, managing change, assessing risk, acting appropriately and decisively under pressure, and staying motivated—relies heavily on sleep.
- MEMORY** (Icon: Head with book)
When we sleep, our brain merges new information into our memory. A good night's sleep can help improve test scores.
- SLEEP LOSS** (Icon: Eye)
Sleep loss reduces mental sharpness and agility. In some cases, it's similar to the effects of alcohol.
- ACCIDENTS** (Icon: Car crash)
Drowsy driving can lead to motor-vehicle accidents, and related injuries and fatalities.
- NUTRITION** (Icon: Scale)
Lack of sleep causes changes to the brain and body that can lead to unwanted weight gain.
- RELATIONSHIPS** (Icon: Two heads talking)
Sleep loss can make it harder to understand others and accurately interpret emotions.
- AFTER DEPLOYMENT** (Icon: House)
Some Warfighters report problems sleeping when they return home.

Chronic fatigue syndrome

- Sleep deprivation is NOT chronic fatigue syndrome
- Sleep eliminates sleep deprivation, but sleep cannot improve CFS
- CFS is a complex disease of unclear etiology that manifests by
 - ✓ Reduced performance
 - ✓ Load intolerance
 - ✓ Sleep disorders
 - ✓ Cognitive disorders with preserved intellect
- Etiology is not clear and is probably multifactorial
 - ✓ Past infection (most commonly reported cause)
 - ✓ Immune system impairment
 - ✓ Endocrine disorders
 - ✓ Neurological/psychological disorders (especially emotional stress)
- Sleep deprivation causes/worsens the course of the above-mentioned etiological factors
- Thus, sleep deprivation is an indirect risk factor for CFS

COMBAT SLEEP DEBT

BEST STRATEGIES

- ENVIRONMENT**
Reduce noise and light, keep a comfortable temperature, and avoid cell phones and other devices at bedtime.
- PRE-SLEEP ROUTINE**
Unwind with a book or meditation about 1 hour before bed.
- WAKE UP**
Wake up at the same time every day, even on your days off.

NEXT BEST

- STRATEGIC NAPS**
As long as you actually *sleep* during a nap, you can pay off your sleep debt. Naps of **any duration** are good. Sleep as long as you can, as often as you can, to avoid sleep debt. The known benefit of sleep far outweighs the small risk of impaired performance ("sleep inertia") that occurs 5–10 minutes upon awakening. Naps at **any time of the day or night** are good—but it's easiest to fall (and stay) asleep for a nap:
 - Around your normal bedtime
 - Around your normal wake-up time
 - In the early afternoon

IN A PINCH

- CAFFEINE**
Although it does not replace sleep, caffeine is an effective tool to temporarily maintain mental performance when you can't get enough sleep. Caffeine gum can reduce grogginess and can be used to maintain some aspects of cognitive performance during sleep deprivation.

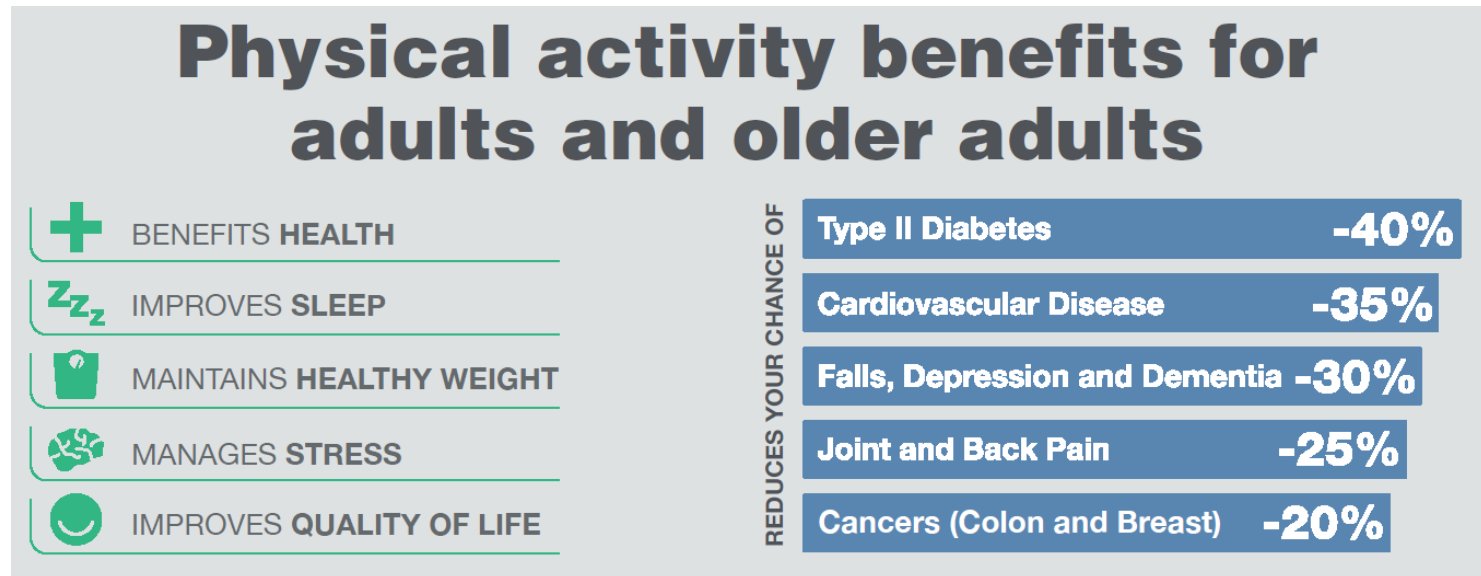
AVOID THESE

- ALCOHOL**
Drinking alcohol before bedtime might make you feel drowsy, but it actually impairs sleep—and increases sleep debt.
- EXCESS CAFFEINE**
Consuming too much caffeine keeps you awake and disrupts sleep. Avoid drinks with caffeine at least 6 hours before bedtime. Caffeine does not replace sleep.
- SLEEP AIDS**
Check with your doctor before using any over-the-counter sleep aids.

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Physical activity

- Reduces the risk of civilization diseases, especially cardiovascular diseases, tumors, DM
- Improves the psychological state, in particular it has a beneficial effect on depression, anxiety and a general feeling of well-being
- Improves cognitive functions: thinking, learning, judgment
- Ensures healthy development in childhood and youth
- Globally, 25% of the adult population does not perform the minimum recommended physical activity
- Up to 5 million deaths per year could be delayed worldwide by increased physical activity
- Insufficiently active individuals have a 20-30% higher risk of death than active individuals
- Globally, more than 80% of youth have insufficient physical activity



Physical activity

- **Recommended**
 - ✓ Aerobic activity
 - ✓ Strength training
 - ✓ (Balance exercise 65+)

- **Beneficial effect**
 - ✓ Body weight
 - ✓ Cardiovascular system
 - ✓ Muscles
 - ✓ Bones
 - ✓ Joints

➤ Weight-bearing activities are preferred

- ✓ Complex (involvement of several muscle groups)
- ✓ Prevention of osteoporosis

World Health Organization 2020 Guidelines On Physical Activity and Sedentary Behaviour

The 2020 World Health Organization (WHO) Guidelines on Physical Activity and Sedentary Behaviour provide evidence-based public health recommendations concerning the amount and types of physical activity that offer significant health benefits and mitigate health risks.

Children and Adolescents Aged 5-17 years	Adults Aged 18-64 years	Older Adults Aged 65+ years	Pregnant and Postpartum Women	Key Points
<p>At least an average of 60 min/day of moderate-to-vigorous aerobic physical activity.</p> <p>AND</p> <p>At least 3x/week of activities that are vigorous-intensity aerobic and activities that strengthen muscle and bone.</p>	<p>At least 150-300 min/week of moderate-intensity aerobic physical activity. OR At least 75-150 min/week of vigorous-intensity aerobic physical activity.</p> <p>At least 2x/week of activities that strengthen all muscle groups.</p> <p><i>Increase moderate-intensity aerobic physical activity to >300 minutes or do >150 minutes of vigorous-intensity aerobic physical activity for additional health benefits.</i></p>	<p>At least 150-300 min/week of moderate-intensity aerobic physical activity. OR At least 75-150 min/week of vigorous-intensity aerobic physical activity.</p> <p>At least 2x/week of activities that strengthen all muscle groups.</p> <p><i>Include varied multicomponent physical activity that emphasises functional balance and strength training 3+ days/week to enhance functional capacity and to prevent falls.</i></p>	<p>At least 150 min/week of moderate-intensity aerobic physical activity.</p> <p>Incorporate a variety of aerobic and muscle-strengthening activities. Gentle stretching may also be beneficial.</p> <p><i>Women who, before pregnancy, habitually engage in vigorous-intensity aerobic activity or who are physically active can continue these activities during pregnancy and the postpartum period.</i></p>	<p>1 For all populations, the benefits of doing physical activity & limiting sedentary behaviour outweigh the potential harms.</p> <p>2 Some physical activity is better than none for those not currently meeting these recommendations.</p> <p>3 Individuals should start with small amounts of physical activity & gradually increase frequency, intensity and duration over time.</p>
<p>Limit the amount of time spent being sedentary, across the lifespan (children and adolescents, adults, older adults and special populations). Replacing sedentary time with physical activity of any intensity provides health benefits.</p>				



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Bull FC, Al-Ansari SS, Biddle S, et al. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *British Journal of Sports Medicine* 2020;54:1451-1462.

➤ The intensity of physical activity can be determined by heart rate, or according to other parameters

- ✓ $HR_{max} = 220 - \text{age}$ nebo $HR_{max} = 207 - (0,7 \times \text{age})$
- ✓ $HRR = HR_{max} - \text{resting HR}$
- ✓ **1 MET:** the energy requirement of one hour of lying still (cca. 1 kcal/kg)
- ✓ **VO₂ max:** the maximum amount of oxygen that organism can use

Table 1
 Categories of exercise intensity and the subjective and objective measures [both absolute and relative] accompanying each category. The relative intensity measures such as % HR_{max}, %HRR [heart rate reserve = HR_{max} – resting HR] and %VO_{2max} [maximal oxygen uptake] will not always correspond to the same RPE among individuals nor will the ability of clients to exercise for a specific duration at each intensity since this varies depending on training status and other personal characteristics. Subjective measures are from Borg's RPE scales where C = category scale [6–20] and C-R = category-ratio scale [0–10] [7].

Intensity category	Objective measures	Subjective measures	Descriptive measures
SEDENTARY	< 1.6 METs < 40% HR _{max} < 20% HRR < 20% VO _{2max}	RPE (C): < 8 RPE (C-R): < 1	• activities that usually involve sitting or lying and that have little additional movement and a low energy requirement
LIGHT	1.6 < 3 METs 40 < 55% HR _{max} 20 < 40% HRR 20 < 40% VO _{2max}	RPE (C): 8-10 RPE (C-R): 1-2	• an aerobic activity that does not cause a noticeable change in breathing rate • an intensity that can be sustained for at least 60 minutes
MODERATE	3 < 6 METs 55 < 70% HR _{max} 40 < 60% HRR 40 < 60% VO _{2max}	RPE (C): 11-13 RPE (C-R): 3-4	• an aerobic activity that is able to be conducted whilst maintaining a conversation uninterrupted • an intensity that may last between 30 and 60 minutes
VIGOROUS	6 < 9 METs 70 < 90% HR _{max} 60 < 85% HRR 60 < 85% VO _{2max}	RPE (C): 14-16 RPE (C-R): 5-6	• an aerobic activity in which a conversation generally cannot be maintained uninterrupted • an intensity that may last up to about 30 minutes
HIGH	≥ 9 METs ≥ 90% HR _{max} ≥ 85% HRR ≥ 85% VO _{2max}	RPE (C): ≥ 17 RPE (C-R): ≥ 7	• an intensity that generally cannot be sustained for longer than about 10 minutes

This table shows the benefits of exercising at different heart rates. Here your maximum heart rate is considered to be 100% and the various zones are different percentages of that. If your maximum heart rate is 200bpm, when your heart rate is between 120 and 160bpm this would place you in the yellow or 'Moderate Effort' zone.

HEART RATE ZONE	50-60% max. heart rate	60-80% max. heart rate	80-90% max. heart rate
	LOW EFFORT	MODERATE EFFORT	VERY HIGH EFFORT
WHAT THE ZONE FEELS LIKE	• Comfortable to Talk and Breathe • Light Sweating • Can Exercise for a Long Time	• Can Talk, Breathing is heavy • Heart Pumping • Lots of Calories Burned in This Zone	• Can't Talk, Breathing is Fast • Very Exhausting • Strength and Speed Improved in This Zone
CARBS & FATS BURNED	CARBS FATS	CARBS FATS	CARBS FATS

	EFFORT	EFFECT
Maximize Performance	MAXIMUM 90-100%	BENEFIT: HELPS FIT ATHLETES DEVELOP SPEED
	HARD 80-90%	BENEFIT: INCREASES MAXIMUM PERFORMANCE CAPACITY FOR SHORTER SESSIONS
Improve Fitness	MODERATE 70-80%	BENEFIT: IMPROVES AEROBIC FITNESS
Lose Weight	LIGHT 60-70%	BENEFIT: IMPROVES BASIC ENDURANCE AND FAT BURNING
	VERY LIGHT 50-60%	BENEFIT: HELPS WITH RECOVERY

Nutrition

- **Macronutrients**
 - Substances necessary for life received in relatively large quantities through food as a source of energy, a structural element, etc. (alcohol is also a source of energy, but it is not a macronutrient)
 - Excessive intake - formation of fat reserves
 - ✓ Carbohydrates
 - ✓ Fats
 - ✓ Proteins
- **Micronutrients**
 - Substances necessary for the proper functioning of the organism, taken in small amounts through food, often in connection with macronutrients (the organism is unable to synthesize micronutrients)
 - Excessive intake - potential toxicity
 - ✓ Vitamins
 - ✓ Minerals
- **Hydration**

Good sources of nutrients

	Carbohydrates + (10-30%)	Fats + (20-100%)	Proteins + (10-30%)
Carbohydrates -		Nuts, seeds, olive oil, cheese	Eggs, meat, fish
Fats -	Pasta, rice, cereal, bread, legumes, fruits, vegetables		Nonfat Greek yogurt, cottage or cream cheese, turkey or chicken breast, lean ground beef
Proteins -	Fruits and vegetables	Avocado, olive oil, coconut milk	

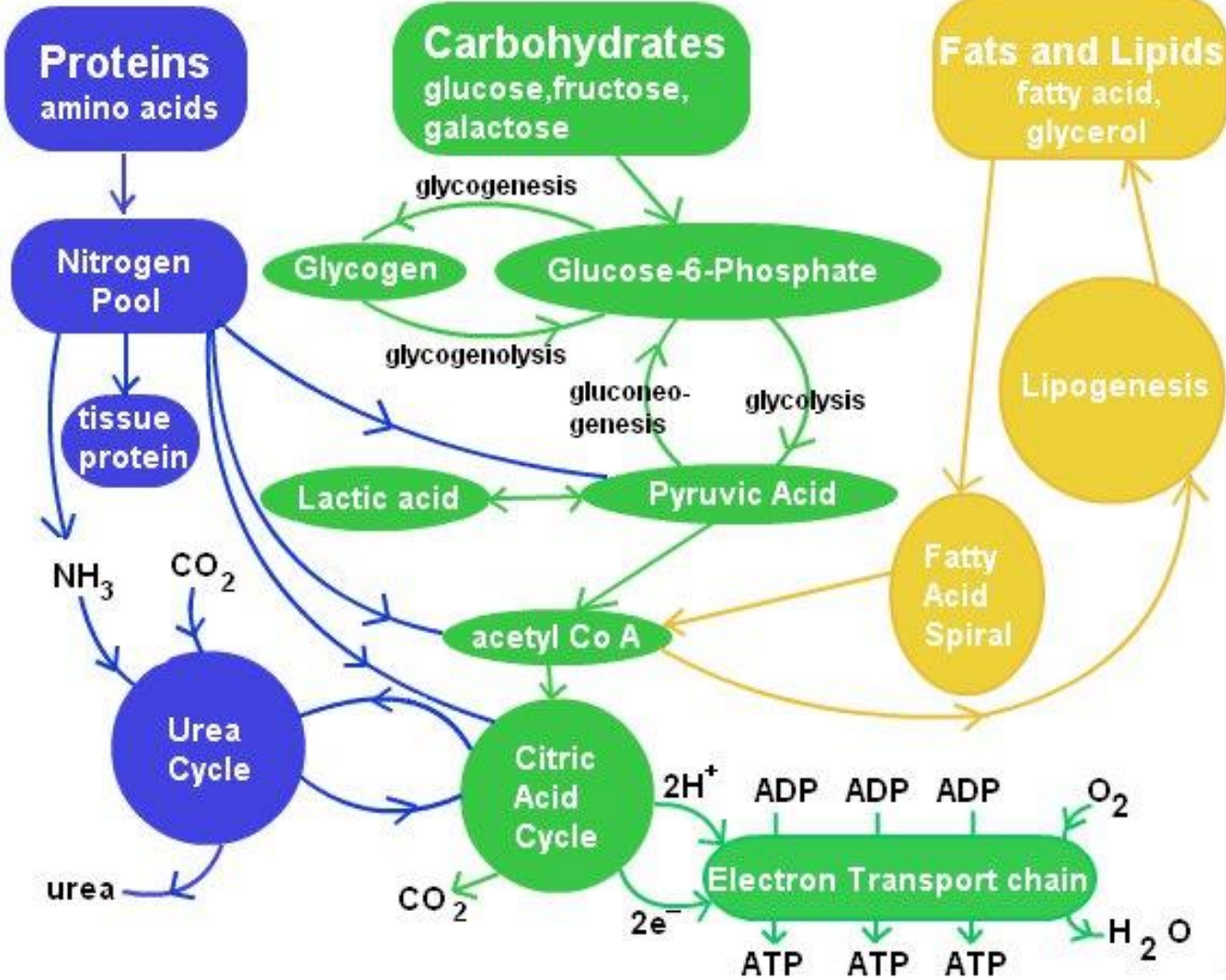
Caloric need

Gender	Age	Sedentary	Moderate	Active
Child	2-3	1000	1000	1000
Female	4-8	1200	1400	1800
	9-13	1600	1600	2200
	14-18	1800	2000	2400
	19-30	2000	2000	2200
	31-50	1800	2000	2200
	51+	1600	1800	2200
Male				
	4-8	1400	1600	2000
	9-13	1800	2200	2600
	14-18	2200	2800	3200
	19-30	2400	2800	3000
	31-50	2200	2600	3000
	51+	2000	2400	2800

<https://readywise.com/blogs/readywise-blog/how-many-daily-calories-will-i-need>

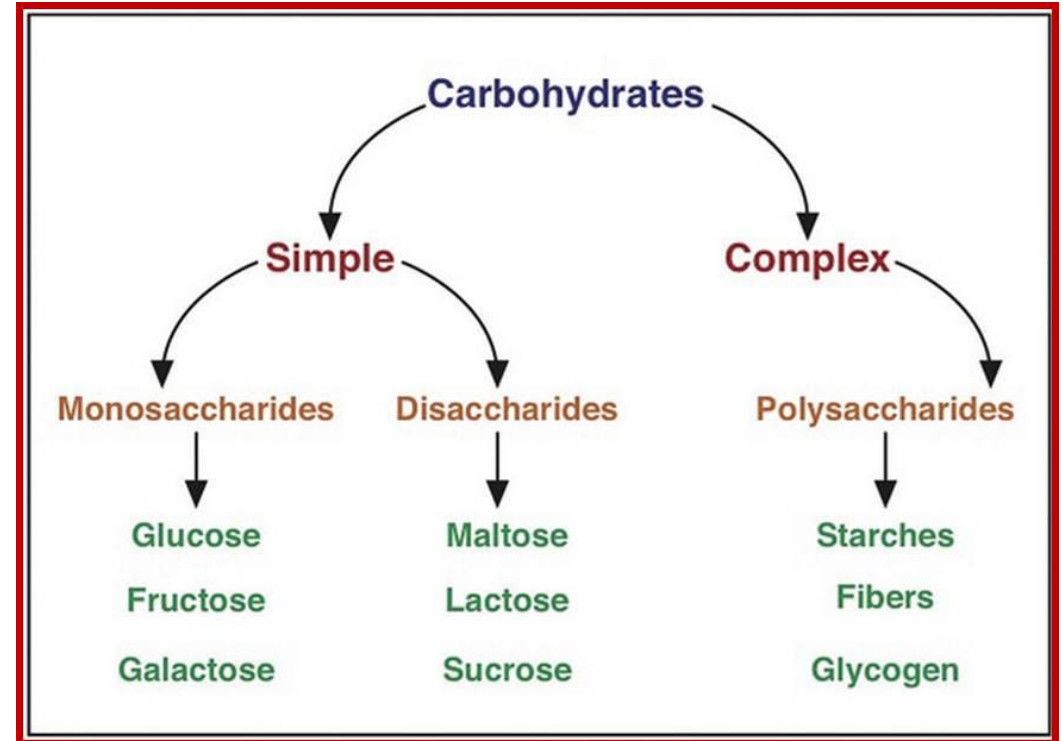
- Energy per gram
 - Fats – 38 kJ (9 kcal)
 - Proteins – 17 kJ (4 kcal)
 - Carbohydrates – 17 kJ (4 kcal)
 - Alcohol – 30 kJ (7 kcal)
- Optimal proportion
 - Carbohydrates – 50%
 - Fats – 30 %
 - Proteins – 20 %

Metabolism Summary



Carbohydrates

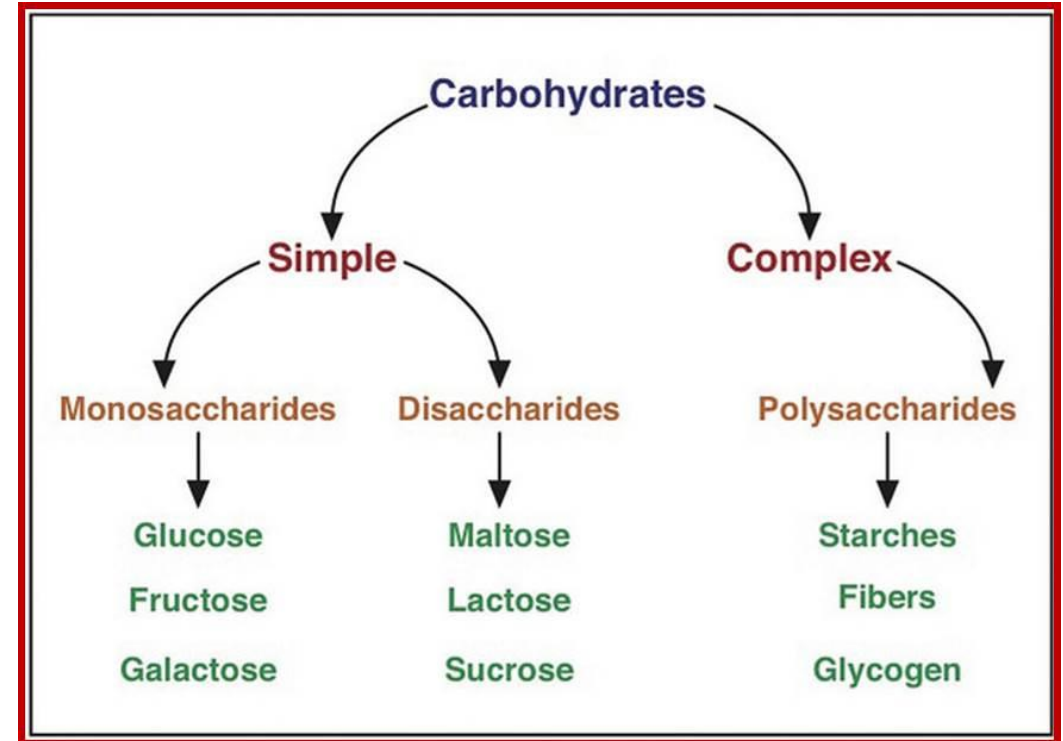
- Building blocks – glucose, fructose, galactose
- Simple
 - Mono/oligosaccharides
 - Sweet taste, easy digestibility, fast absorption
 - ✓ Sugar, sweets, white flour
 - ✓ Ripe fruit (also contains vitamins, minerals, fiber and therefore considered suitable)



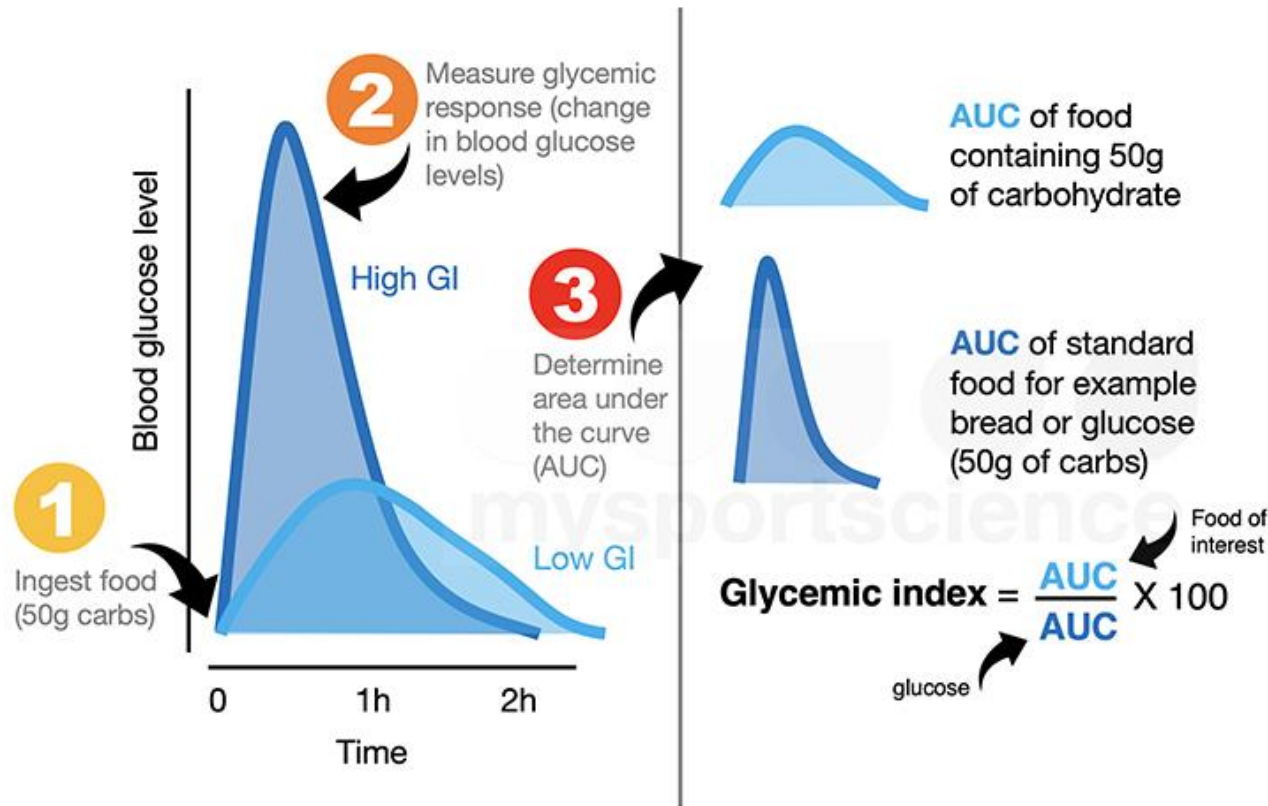
<https://en.wikipedia.org/>

Carbohydrates

- Complex
 - Polysacharides
 - Starch, fiber
 - Stach
 - Longer digestion time, slow to zero absorption
 - Low glycemic index (better insulin response)
 - ✓ Bread, cereals, rice, pasta, legumes, vegetables



Glycemic index



High GI (70-100)

Carbohydrates which break down **quickly** during digestion, releasing blood sugar **rapidly** into the bloodstream

Medium GI (56-69)

Carbohydrates which break down **moderately** during digestion, releasing blood sugar **moderately** into the bloodstream.

Low GI (0-55)

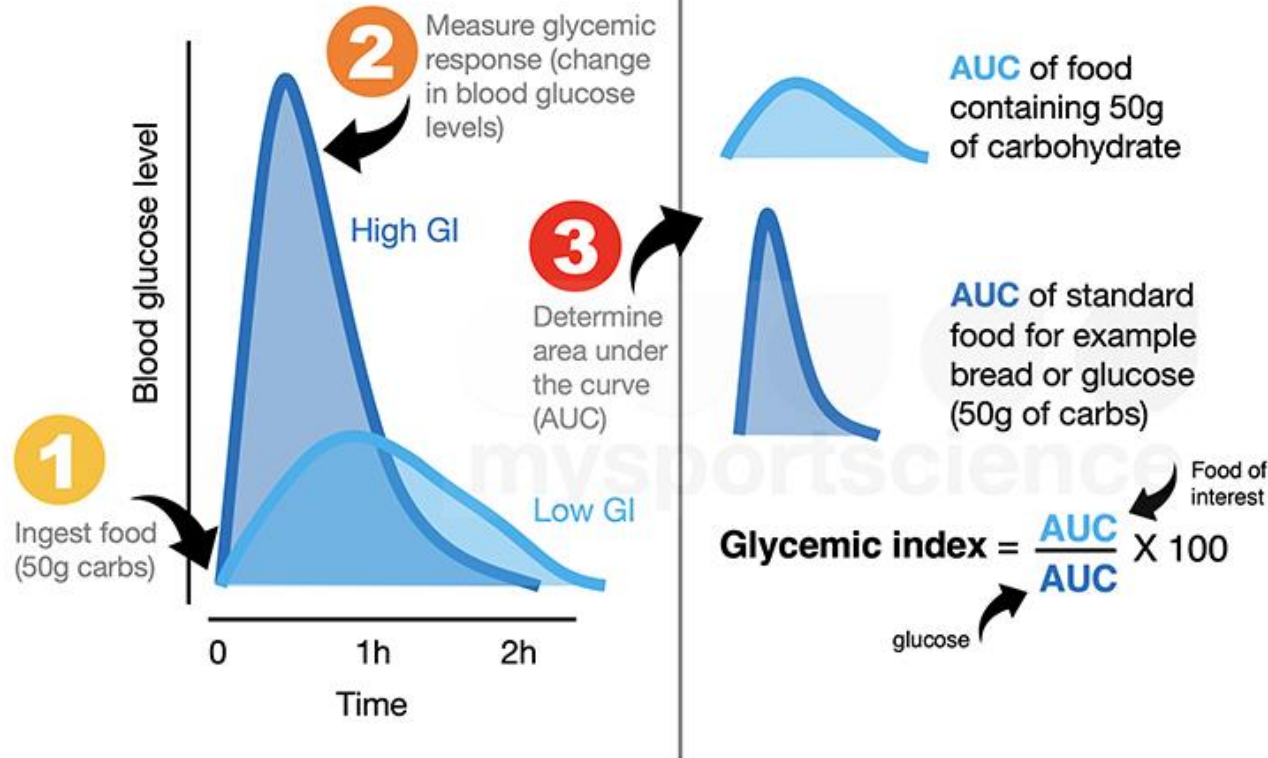
Carbohydrates which break down **slowly** during digestion, releasing blood sugar **gradually** into the bloodstream

Glycemic index

Glycemic Load
✓ Takes portion size into account
✓ $GL \text{ (per serving)} = GI/100 \times \text{carbohydrate content per serving (g)}$



www.mysportscience.com



High GI (70-100)
Carbohydrates which break down **quickly** during digestion, releasing blood sugar **rapidly** into the bloodstream

Medium GI (56-69)
Carbohydrates which break down **moderately** during digestion, releasing blood sugar **moderately** into the bloodstream.

Low GI (0-55)
Carbohydrates which break down **slowly** during digestion, releasing blood sugar **gradually** into the bloodstream

Natural vs. added sugar

- Natural sugar
 - Fruits, vegetables, dairy products
 - Naturally bound to another nutrient – vitamins, minerals, macronutrients, water
- Added sugar
 - Added during food processing in addition to natural sugar
 - A lot of calories, a minimum of other nutrients
 - Increases cardiovascular risk (via increased triglycerides)

Natural vs. added sugar

- Natural sugar
 - Fruits, vegetables, dairy products
 - Naturally bound to another nutrient – vitamins, minerals, macronutrients, water
- Added sugar
 - Added during food processing in addition to natural sugar
 - A lot of calories, a minimum of other nutrients
 - Increases cardiovascular risk (via increased triglycerides)

Recommended intake of added sugar per day

- ✓ Maximum – cca. 30g
- ✓ Reality – cca. 80g

Sources of added sugar

- ✓ Sweets
- ✓ Sweet drinks
- ✓ Flavored yogurts
- ✓ Candied fruit
- ✓ Ketchups, dressings, sauces
- ✓ Sausages
- ✓ Pastry

Fructose vs. fructose syrup

- Fructose
 - Naturally present in the fruit in connection with fiber, vitamins, enzymes
- Glucose-fructose syrup
 - Inexpensive sweetener made from starch (corn, wheat)
 - Starch hydrolysis to glucose, glucose isomerization to fructose, filtration and water removal
 - Sweeter than white sugar
 - Calorically dense, no other nutrients
 - Increases cardiovascular risk (via increased triglycerides))
 - Highly addictive (PMID: 1875782, PMID: 20800122)

Artificial sweeteners

- More types, because it is difficult to mimic a sweet taste - individual - everyone has to find what he likes
- Stevia, aspartam, sucralose
 - No calories, sweeter than white sugar
 - They can disrupt the microbiome
 - Addictive
 - Potential disturbance of metabolism
- Polyols – xylitol, sorbitol, erythritol
 - Caloric content, however less calories than white sugar
 - Less/as sweet as white sugar
 - May cause GIT distress (FODMAP)

FODMAP

- Fermentable carbohydrates may potentially irritate GIT
- Problems ranging from intestinal discomfort to diarrhea
- F - Fermentable and refers to the following groups of short-chain carbohydrates or sugars:
 - O - oligosaccharides
 - D - disaccharides
 - M - monosaccharides
 - P - polyols

Recommendations for carbohydrate intake

- As much complex carbohydrates as possible from natural sources
 - Fruits, vegetables, nuts, seeds, whole grains, brown rice
 - Carbohydrates linked to vitamins, minerals, fiber, proteins...
- Fewer complex refined carbohydrates
 - White rice, white bread, regular pasta
 - Industrial food processing mainly destroys fiber
- As little added sugar as possible
 - Empty calories - only energy, a minimum of other nutrients

Fiber

- Recommended intake approx. 30g/day (larger amounts may cause diarrhea)

➤ Soluble

- Binds water and forms a gel – increases in volume
- Fermentation in the intestine
 - Prebiotic – nutrient for the microbiome
 - Partial absorption – source of energy
- Regulation of fat and carbohydrate digestion
- ✓ Oatmeal, apples, peaches, sweet potatoes

➤ Insoluble

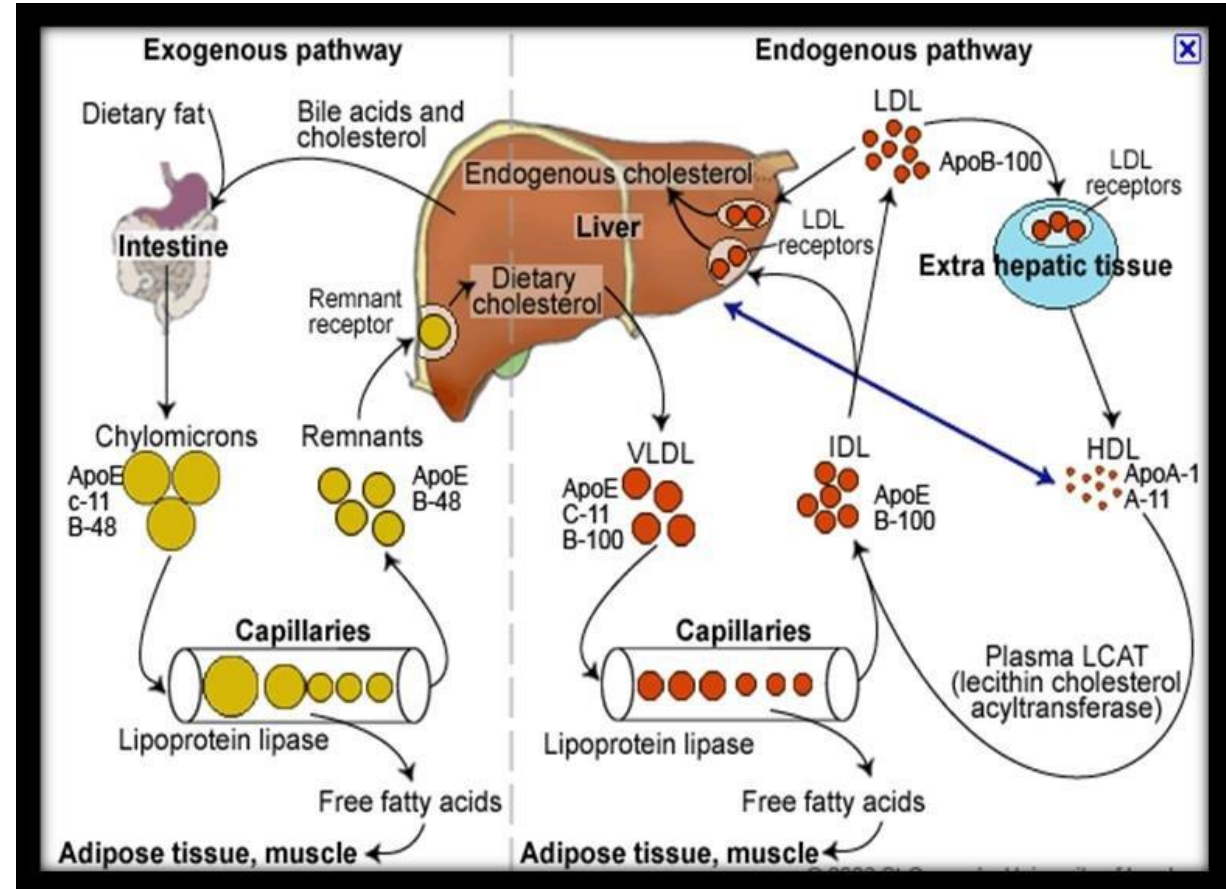
- Does not ferment
- Increases stool volume (shortens passage time)
- Dilutes/binds waste materials that are potentially toxic
- ✓ Skin of fruit and vegetables, whole grain bread, nuts

Benefits of fiber

- Feeling of satiety
- Favorably affects cholesterol and blood sugar levels (slowing down absorption)
- Favorably affects the microbiome (prebiotic)
- beneficial effect on laxation
 - Soluble fiber softens the stool
 - Insoluble fiber thickens the stool
- Reduces the risk colorectal carcinoma development (binding of potentially harmful substances)

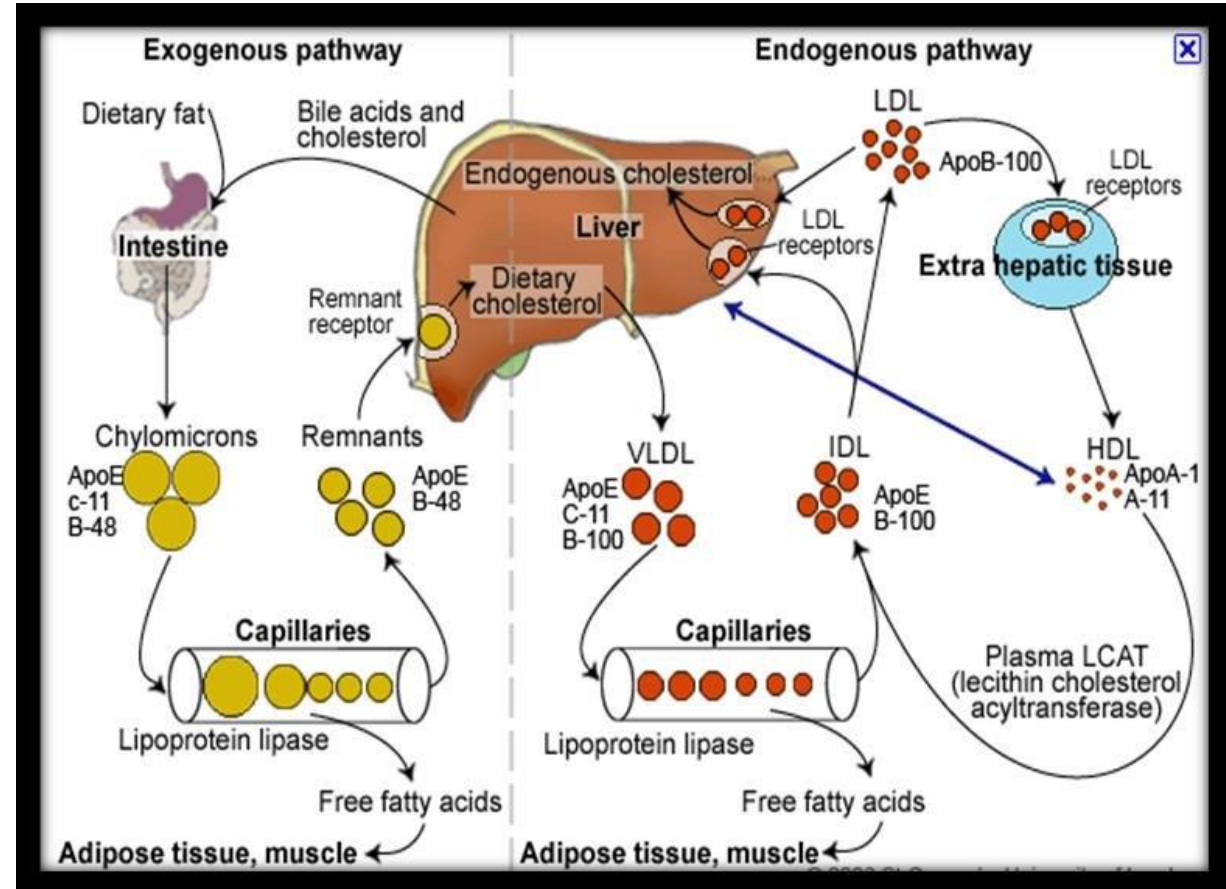
Fats

- Structural function – membranes
- Brain – 60% fat content
- Energy storage
 - Preferred fuel for daily activities and low-intensity physical activity – saving glucose for the brain and erythrocytes
 - The highest utilization during caloric deficit
- Beta oxidation requires glucose as a source of oxaloacetate for the citrate cycle, when deficient, acetyl CoA is metabolized to ketone bodies ("fats burn in a carbohydrate flame")



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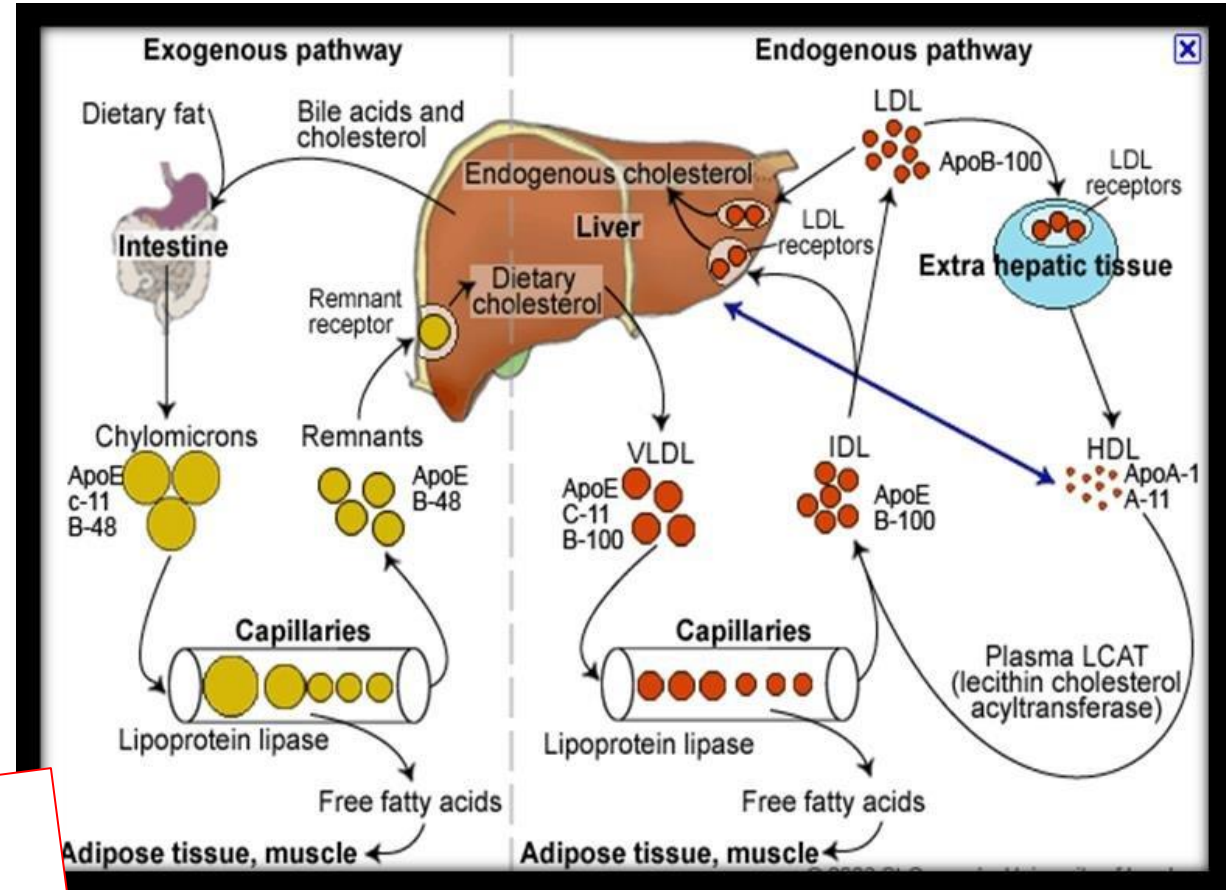


Tuky

- Strukturální funkce – membrány
- Mozek – 60% tuku
- Zásoba energie
 - Preferované palivo pro každodenní aktivity a fyzickou aktivitu o nízké intenzitě - snaha šetřit glukózu pro mozek a erytrocyty
 - Největší využití v případě kalorického deficitu
- Beta oxidace vyžaduje glukózu jako zdroj oxalacetátu pro citrátový cyklus, při nedostatku se acetyl CoA metabolizuje na ketolátky („tuky hoří v ohni sacharidů“)

Sources of dietary fat

- Natural sources
- ✓ Dairy products, meat, fish, nuts and seeds, oil, olives, avocado
- Industrially processed food



Unhealthy fats

➤ Saturated fatty acids

- Solid at room temperature
- A significant risk factor for increased LDL (cardiovascular risk)
- They should represent maximally 10% of caloric intake
- ✓ Meat, dairy products, coconut and palm oil

➤ Trans fatty acids

- They are produced industrially during the solidification of fats (hydrogenation of unsaturated fatty acids)
- Solidification of fats - extension of shelf life
- They raise LDL and lower HDL (very high cardiovascular risk)
- Recommended intake: 0

Healthy fats

➤ **Monounsaturated (MUFA), polyunsaturated (PUFA) fatty acids**

- Avocado, nuts, seeds, salmon, tuna, mackerel
- **Omega-3 a Omega-6 fatty acids**
 - Essential PUFAs
 - In addition to the positive effect on HDL/LDL, important for immunity and embryonic development (especially omega-3)
 - Omega-6 (linolenic acid)
 - Recommended intake approx. 15 g/den
 - ✓ Vegetable oils, soybeans
 - Omega-3 (kyselina alfa-linolenová) –
 - Recommended intake approx. 1,5 g/den
 - ✓ "fatty fish", linseed, linseed oil

Fats

- Fat is preferentially used as fuel at rest or during low-intensity activity (approx. up to 70% HRMAX)
- Fat intake does not automatically lead to the formation of fat stores
- Everything depends on caloric intake (excess calories from protein / carbohydrates are converted into fat stores too)
- However, fat is calorically denser, so with a caloric surplus, fat represents 2 times more energy than carbohydrates or proteins
- Low/zero fat foods may not be lower in calories as they may contain more sugar to enhance taste (marketing)

Proteins

- Dietary proteins are metabolized into amino acids
- In small intestine, the amino acids are absorbed to the circulation from where they are available for the needs of cells
- Amino acids are not stored, excess amino acids are converted into glucose-glycogen or fatty acids
- In the case of adequate caloric intake, amino acids are conserved and fat/carbohydrates are used as the preferred energy source
- In the case of chronic caloric deficit
 - Insufficient production/catabolism of immunoglobulins
 - Muscle catabolism (especially during inactivity)

Amino acids

➤ Essential

- ✓ Valine, leucine, isoleucine, phenylalanine, tryptophan, threonine, methionine, lysine

➤ Semi-essential

- Essential in childhood
- ✓ Histidine, arginine

➤ Conditionally essential

- They can be synthesized from essential amino acids
- ✓ Tyrosine (from phenylalanine), cysteine (from methionine)

➤ Non-essential

- ✓ Glycine, alanine, serine, aspartate, glutamate, asparagine, glutamine, proline

➤ Complete protein sources

- They contain all essential amino acids
- ✓ Meat, fish, eggs, dairy products, soy, buckwheat, quinoa

➤ Incomplete protein sources

- They lack at least one essential amino acid
- It is necessary to combine several sources
- ✓ Beans, nuts, seeds, whole grains, vegetables

Recommended intake
Minimum: 0,8 g/kg/day
✓ **More in case of regular physical activity**

- **Endurance training**
 - ✓ **Running, cycling, swimming**
 - ✓ **1,2-1,4 g/kg/day**
- **Strength training**
 - ✓ **1,4-2 g/kg/day**
- **Consume proteins together with polysaccharides after training for better muscle regeneration**

Protein supplements

- Most often based on whey protein or casein
- Casein - the main protein in mammalian milk
 - It represents up 80% of cow's milk proteins
 - Milk coagulation – precipitated casein + whey
 - Acid precipitation – using acids produced by lactic acid bacteria (mainly lactic acid)
 - ✓ Yogurts, cottage cheese, some cheeses
 - Sweet precipitation - with the help of rennets (chymosins – protease enzyme splitting casein, products subsequently precipitate even without acidification)
 - ✓ Majority cheeses
- Whey – a by-product of milk production
 - Rich in vitamins, minerals, proteins, lactose
 - ✓ Žinčica, protein powders

Mikronutrienty

WATER-SOLUBLE VITAMINS

- ✓ Thiamin
- ✓ Riboflavin
- ✓ Niacin
- ✓ Vitamin B6
- ✓ Vitamin B12
- ✓ Folate
- ✓ Pantothenic acid
- ✓ Choline
- ✓ Vitamin C
- ✓ Biotin

FAT-SOLUBLE VITAMINS

- ✓ Vitamin A
- ✓ Vitamin D
- ✓ Vitamin E
- ✓ Vitamin K



VITAMINS & MINERALS

Eating a balanced diet of whole foods is the ideal way to get the proper amount of micronutrients to support the structural and functional needs of the body.

myfitnesspal

MACROMINERALS

- ✓ Sodium
- ✓ Potassium
- ✓ Chloride
- ✓ Calcium
- ✓ Phosphorus
- ✓ Magnesium

TRACE ELEMENTS

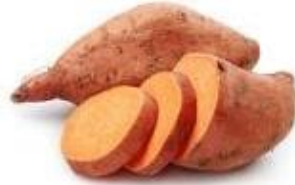
- ✓ Chromium
- ✓ Copper
- ✓ Fluoride
- ✓ Iodine
- ✓ Iron
- ✓ Manganese
- ✓ Molybdenum
- ✓ Selenium
- ✓ Zinc

Mikronutrienty

BENEFITS

- energy production
- nerve function
- immune function
- red blood cell formation (B12)
- reduces birth defects (folate)

VITAMIN A



SOURCES

- butternut squash
- carrots
- kale
- liver
- mango
- spinach
- sweet potatoes

BENEFITS

- bone mineralization
- calcium absorption
- immune function

VITAMIN D



SOURCES

- sunshine
- eggs
- fortified milk
- salmon
- tuna

BENEFITS

- vision
- reproduction
- immune function
- growth

VITAMIN B



SOURCES

- butternut squash
- carrots
- kale
- liver
- mango
- spinach
- sweet potatoes

BENEFITS

- antioxidant
- immune function

VITAMIN E



SOURCES

- fortified cereals
- seeds
- nuts
- vegetable oil

BENEFITS

- antioxidant
- collagen formation
- iron absorption

VITAMIN C



SOURCES

- bell pepper
- Brussels sprouts
- citrus fruits
- kiwi
- tomato

BENEFITS

- blood clotting
- bone health

VITAMIN K



SOURCES


- asparagus
- broccoli
- Brussels sprouts
- dark leafy greens

Mikronutrienty

BENEFITS

- bone and tooth health
- muscle contraction
- nerve signaling
- heart rate regulation

CALCIUM




SOURCES

- cheese
- fortified cereals
- milk and soy milk
- yogurt

BENEFITS

- important electrolyte
- muscle contraction
- nerve signaling
- fluid balance and hydration

POTASSIUM




SOURCES

- baked potato with skin
- beans
- dark leafy greens
- dried apricots

BENEFITS

- thyroid function
- cell metabolism

IODINE



SOURCES

- baked potato with skin
- cod
- dried seaweed
- iodized salt
- milk

BENEFITS

- important electrolyte
- muscle contraction
- nerve signaling
- fluid balance and hydration

SODIUM



SOURCES

- bouillon and soups
- cheese
- deli meat
- pickled foods
- salt
- soy sauce

BENEFITS

- red blood cell formation
- oxygen transport
- immune function
- enzyme and DNA formation

IRON



SOURCES

- beans
- beef and lamb
- clams
- dark leafy greens
- liver
- nuts
- pumpkin seeds

BENEFITS

- immune function
- cell division
- wound healing
- carbohydrate metabolism

ZINC



SOURCES

- beef and lamb
- cocoa
- oysters
- pumpkin seeds
- wheat germ

Micronutrients

SODIUM ACCUMULATION IN PROCESSED VS. UNPROCESSED FOODS

Peach
(0mg Sodium)

Tomato
(6mg Sodium)

Canned Peaches
(8mg Sodium)

Tomato Paste
(73mg Sodium)

Peach Pie
(326mg Sodium)

Marinara Sauce
(515mg Sodium)

Hydration

- Recommended daily intake
 - ✓ Men: 3,7 l
 - ✓ Women: 2,7 l
 - ✓ More during physical activity/ hot day
- About 20% of the recommended intake is from food
- Alcohol – inhibition of antidiuretic hormone secretion

M U N I

M E D