The Basisc of Hygiene in Dentistry:

Prevention (types, goals, methods).

Preventable risk factors in cardiovascular and oncologic diseases.

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Dept. of Public Health

aZLHE0711p Bases of Hygiene in Dentistry - lecture (autumn 2018)

Lectures on Wednesdays, 13.30 – 16.10, Dep. of Public Health, School year 2018/19
Room A21/111.

26.9. MUDr. M. Kolářová, CSc.: **Basic data in epidemiology of infectious diseases.**
Three parts of the chain of infections´ dissemination; their role in the primary
prevention of Infectious diseases

3. 10. MUDr. M. Kolářová, CSc.: **Vaccination. Actual news in epidemiology**
The overview about the procurable vaccination, their impact on public Health.

10.10. Doc. MUDr. J. Fiala, CSc.: **Prevention (types, goals, methods). Preventable risk factors in cardiovascular and oncologic diseases**
Basic definition of different forms of prevention (primary, secondary, tertiary).The
common preventable risk factors of the most frequent serious chronic diseases
influencing the public morbidity and possibilities of their prevention.

17.10. Prof. MUDr. D. Hrubá, CSc.: **Smoking and health. Smoking cessation.**
Smoking is the most important single preventable risk factor for many diseases,
Including the dental diseases, as well as the mental disease due to development of
Dependence. Basic recommendations for smoking cessation in the dentist´s practice.

24. 10. Prof. MUDr. Z. Derflerová Brázdová. DrSc.: **Dietary guidelines**
The role of nutrition in Health promotion and Health protection. The official
recommendations for the „healthy" nutrition with the concern on dental Health.

31.10. Prof. MUDr. D. Hrubá, CSc.: **Work and health. Occupational risk factors and their outcomes. Toxicology of mercury.**
The role of dentists in the prevention of some occupational diseases; basic
recommendation for the dentists´ protection against occupational risk factors.

7.11. MUDr. M. Kolářová: **Nosocomial infections and hygiene**
Nosocomial infections are serious risk factors, which are preventable by several
methods. Such Health damages can occur even in the dental offices.

Subject scope

- **The basic general principles and methods of health protection**

- **Non-infectious factors affecting health** (environmental, occupational, nutritional and other lifestyle factors…)

- **Infectious factors** (infectious epidemiology)

Exam questions (topics)

- **A) Hygiene and preventive medicine – 15 questions**

- **B) Epidemiology of infectious disease – 22 questions**

- For the exam, every student picks randomly one A-question and one B-question

Basics of hygiene in dentistry – exam questions

A) Hygiene and preventive medicine

1. Main determinants of health

2. Hygiene, epidemiology, preventive medicine – the scope, priorities, aims. Types of preventions, strategies.

3. The main preventable risk factors of cardiovascular diseases (atherosclerosis), connections to dentistry, dental health.

4. The main preventable risk factors of cancer, connections to dentistry. Cancer prevention in dentistry.

5. Basics in nutrition. Basic nutrients, food groups. Energy.

6. Dietary guidelines (generally)

7. Diet and nutrition for dental health

8. Ergonomics: the scope, implications, examples

9. Occupational health risks (non-infectious) associated with work in dentistry, other than physical workload and mercury.

10. Physical workload as a occupational risk factor in dentistry, prevention, compensation exercises

11. Mercury, the risks associated with its using in dentistry. Exposure, health impacts, remedies

12. Smoking a health, health consequences (generally). Specific impact on oral and dental health.

13. The programme 4A in dentistry practice

14. The possibilities of pharmacological support in smoking quitting

15. The preventive programs for healthy teeth

B) Epidemiology of infectious diseases

1. Chain of infection – epidemic process. The importance of environmental and social circumstances, intensity levels of the process of spreading.

2. Presence of a source of infection. The importance of various clinical forms of a disease, infectiousness at each stage of a disease, carriers of pathogenic microorganisms from the epidemiological point of view.

3. Possibility of the transmission of infection. Phases of transmission, effects of environmental factors, resistance in microorganisms, the portal of entry of an infection, special ways of transmission.

4. Susceptibility of the population to the infection.

5. The vaccination schedule in the Czech Republic.

6. The current epidemiological situation in the Czech Republic. Epidemiological surveillance.

7. Decontamination, theoretical principles of sterilization and disinfection.

8. Epidemiological characteristics of intestinal infections caused by bacteria and prevention of their spreading.

9. Epidemiological characteristics of intestinal infections caused by viruses and prevention of their spreading.

10. Epidemiological characteristics of bacterial airborne infections and prevention of their spreading.

11. Epidemiological characteristics of tuberculosis and prevention of their spreading.

12. Epidemiological characteristics of viral airborne infections and prevention of their spreading.

13. Epidemiological characteristics of blood infections and prevention of their spreading.

14. Epidemiology and surveillance of nosocomial infections.

15. Infections of skin and superficial mucous membrane – epidemiological characteristics and preventing their transmission.

16. Infections as occupational diseases and their prevention.

17. Infections in travelling and their prevention.

18. Animals as sources of infection.

19. Work out the principles of safe manipulation with biological materials. Work out a schedule for prophylactic measures in case a health service worker has been wounded with a contaminated object.

20. Being the head of the intensive care unit, suggest how to check if the epidemiologic regulations are being followed.

21. Work out the principles of safe manipulation with the aids and instruments for operative intervention, a) for one-use material b) for material which can be used repeatedly.

22. Work out preventive and repressive precautions against the spreading of influenza.

Why ?

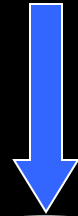## 5 Reasons for teaching Hygiene and Preventive Medicine in Dentistry:

1. Prevention works also in dentistry

2. Oral health is greatly influenced by factors like nutrition, smoking, hygiene, infections….)

3. Oral health is closely connected with main diseases and their risk factors

4. Occupational hygiene (physical and chemical factors): risks both for medical staff and patients

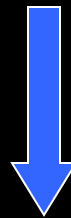5. Infections (respiratory, parenteral): risks both for medical staff and patients

Determinants of health

External influences (including lifestyle) → Hereditary dispositions (genotype) → Health
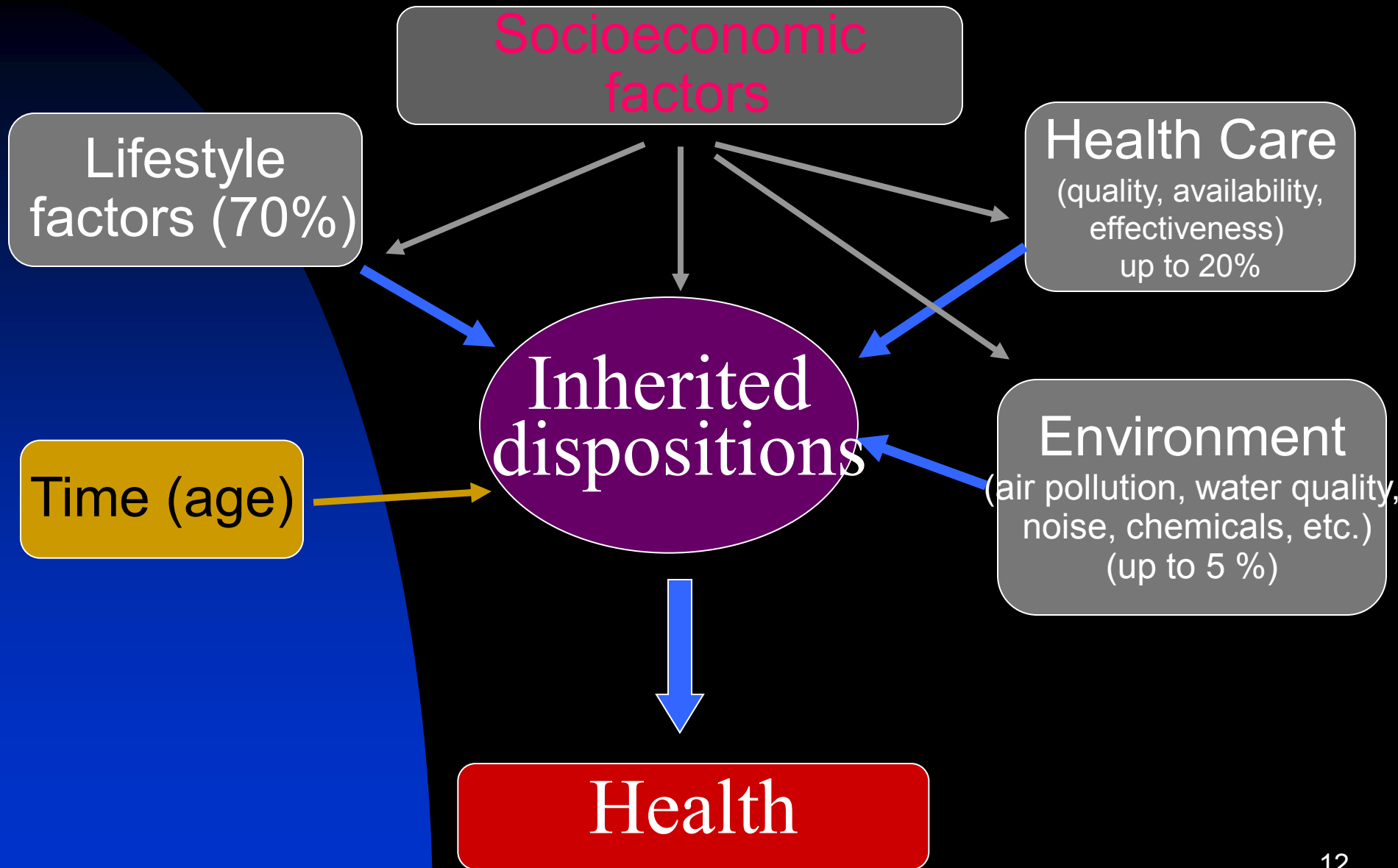
On what depends, how healthy we are

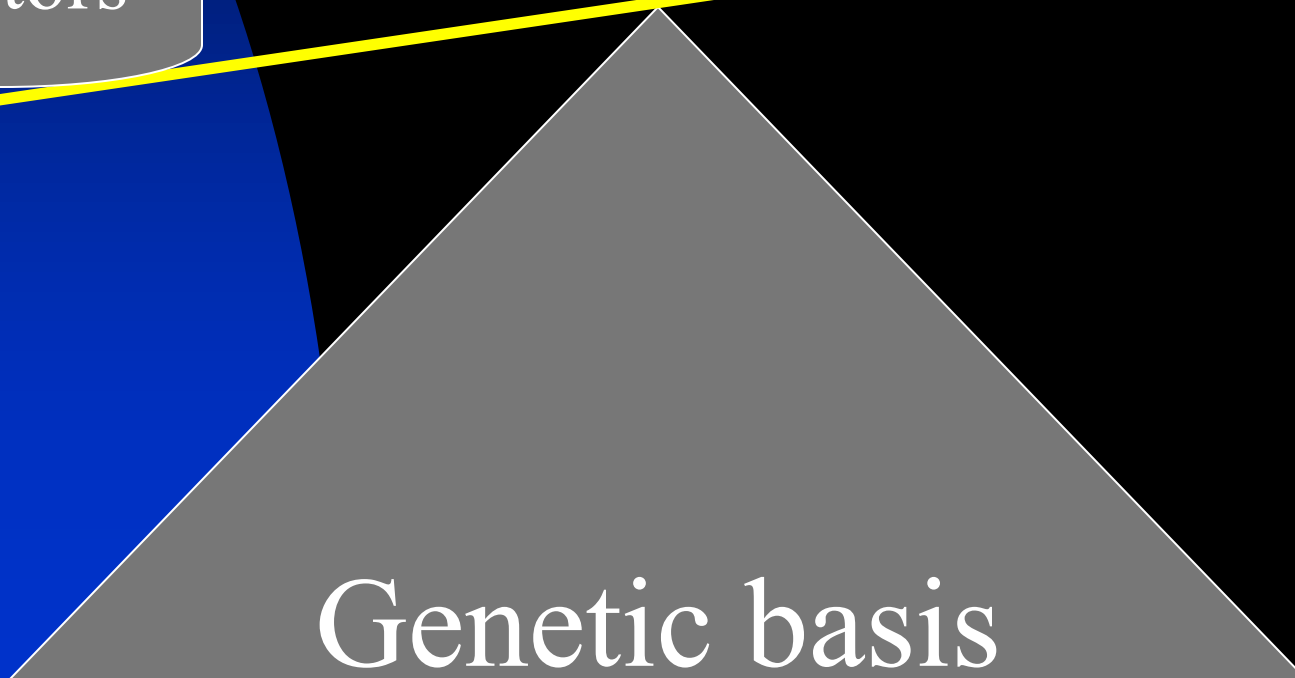Socioeconomic factors

Lifestyle factors (70%)

Health Care
(quality, availability, effectiveness)
up to 20%

Time (age)

Inherited dispositions

Environment
(air pollution, water quality, noise, chemicals, etc.)
(up to 5 %)

Health

Health determinants

The result depends
on the balance

Protective
factors

Risk
factors

ILLNESS - HEALTH?

Genetic basis

Progress of individual health– different combinations of genetics ans lifestyle

Excellent health (condition)

Health quality (of life)

Excellent genotype + very healthy lifestyle

Excellet genotype + very unhealthy lifestyle

Bad genotype + healthy lifestyle

Health

Disease

Bad genotype + unhealthy lifestyle

Serious illness, death

Youth

Time, age

Elderly

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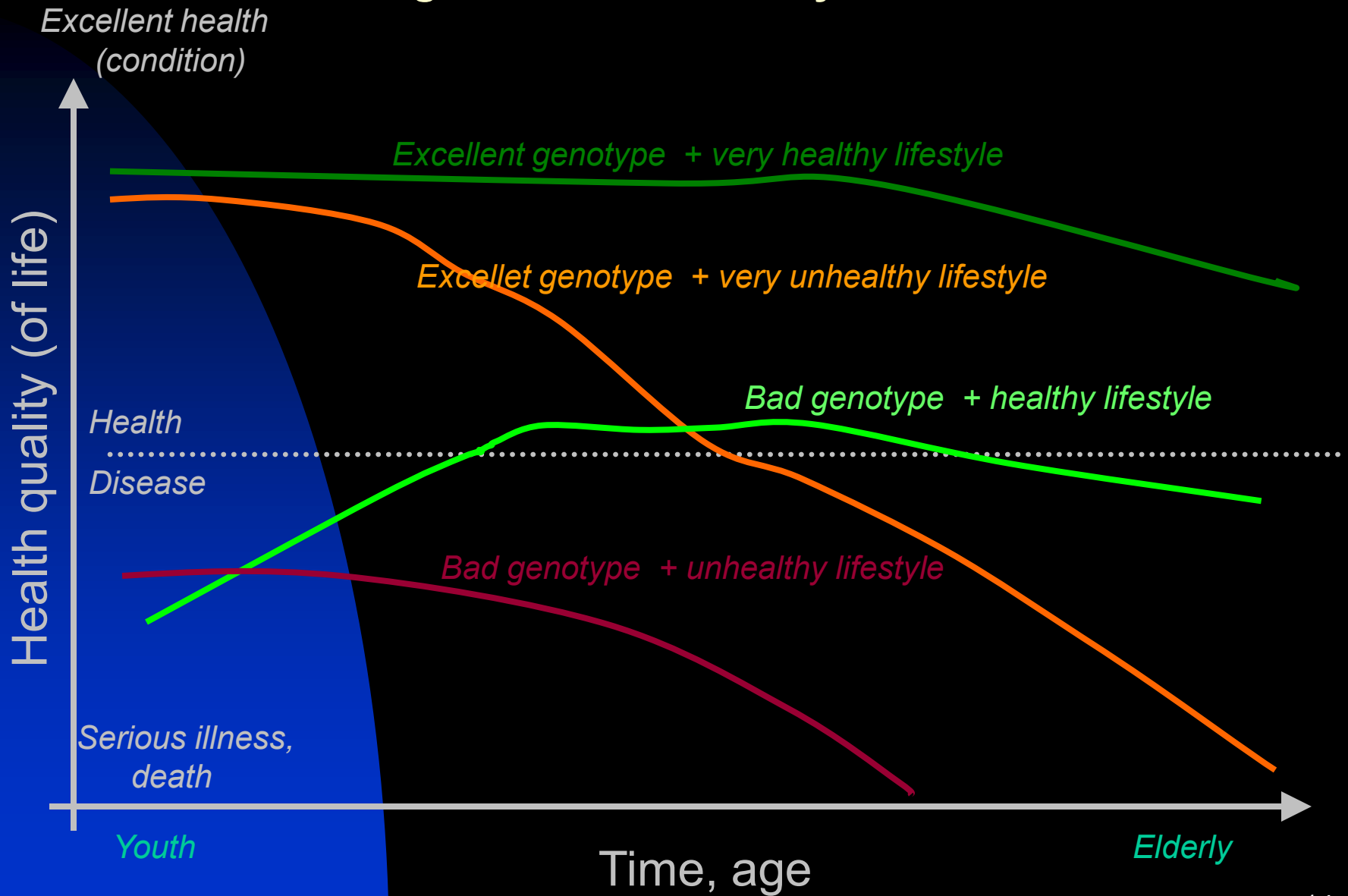
Health protection and promotion

1) Protection against harmful external influences

     a) Environmental (physical, chemical, biological)

     b) Harms mediated by bad lifestyle

2) Health promotion

     a) Healthy lifestyle

     b) Medical promotion of imunity

Hygiene, preventive medicine, epidemiology

Hygiene:

- Environment and its impact on health (living conditions, work…)

Preventive medicine:

- Health protection, disease prevention, health promotion

Epidemiology:

- Study of the distribution and determinants of diseases

TYPES OF PREVENTION

Prevention levels	Principle:
Primary	Prevent the origin of ilness – by eliminating the causes of disease and/or by promoting the resistence
Secondary	Early diagnosis of disorder, interruption of the development of the disease before the symptomatic stage
Terciary	Reduce the progression of disease, prevent new attacs of disease

Levels of prevention
a) primary, b) secondary, c) tertiary

a. Primary prevention is the prevention of disease or injury. Primary prevention activities can be directed at individuals or at the environment.

(1) Health education: encouraging people to develop good health habits (nutrition, exercise), to avoid harmful substances (alcohol, tobacco, drug abuse) and harmful circumstances (driving while intoxicated) and to use specific protective measures (e.g., immunizations, condom use).

(2) Environmental modification can decrease injuries from falls, fires, or automobile accidents. Environmental sanitation is used to provide an adequate sewage system, safe drinking water, clean air, and environment free of toxic substances.

b. Secondary prevention

is the early detection and prompt treatment of disease.

(1) Screening programs are used to **detect diseases** in **early preclinical stages**, when effective therapy may **either cure** the disease **or limit its progression** (e.g., neonatal detection of phenylketonuria, the Pap test to detect in situ carcinoma of the cervix, glaucoma testing).

(2) Primary medical care is the **predominant form** of secondary prevention. Most health expenses are spent on, and most health care personnel are employed in, primary care.

c. Tertiary prevention is the **limitation of disability** and the **rehabilitation** from disease. It emphasizes a person's remaining abilities and attempts to restore the person to as normal a life as possible.

2 strategies in prevention:

■ Population approach

■ Individual approach (also „high risk strategy")

What belongs to primary prevention

- Lifestyle:
  - No-Smoking
  - Healthy diet
  - Physical activity

- Occupational hygiene

- Environmental hygiene
  (air, water, noise, radiaton…)

- Food safety

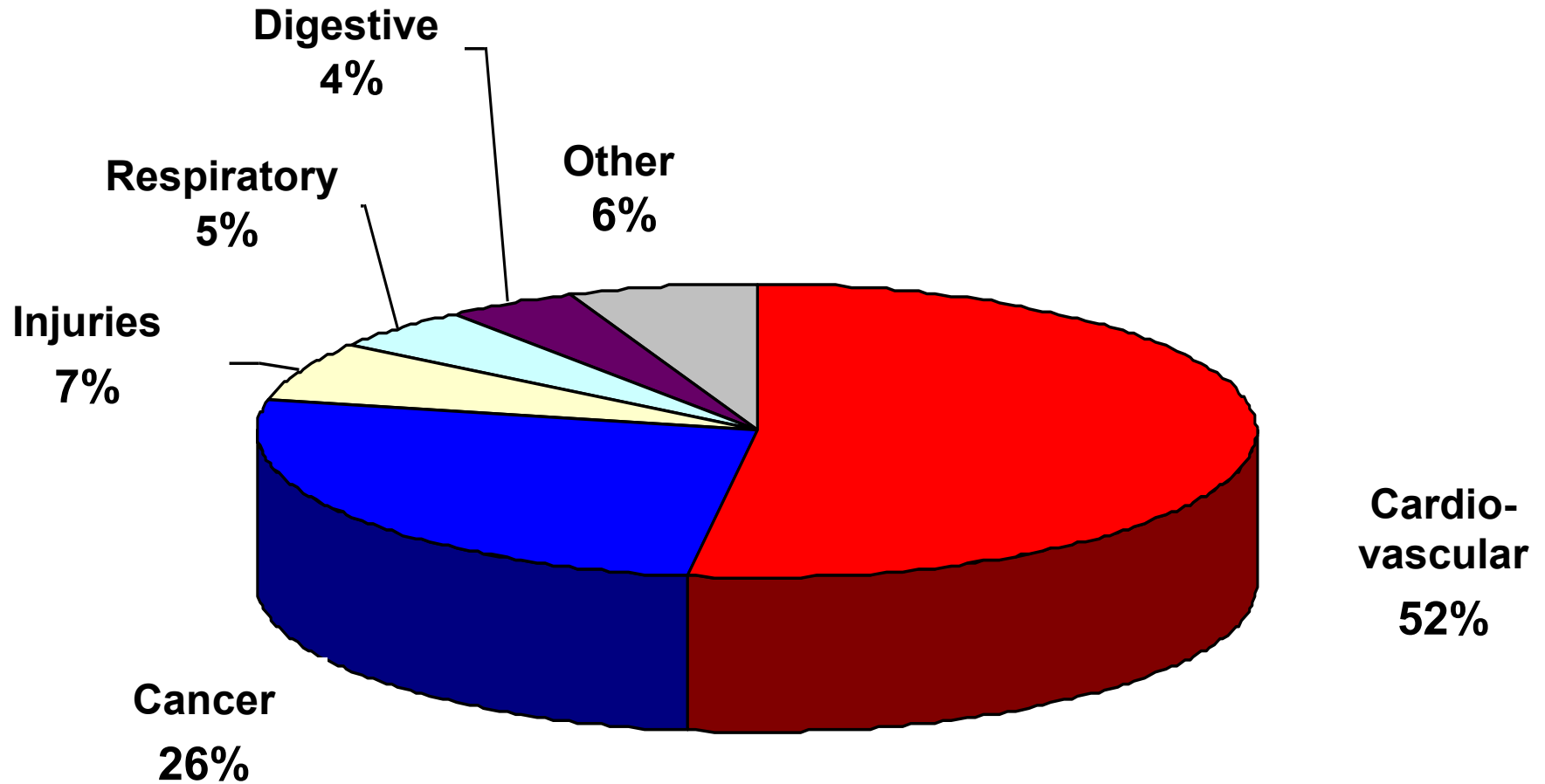- Common hygiene (transmission of infections)

- Vaccination

What belongs to secondary prevention

- ■ Screening, preventive check-ups with the aim of early diagnosis

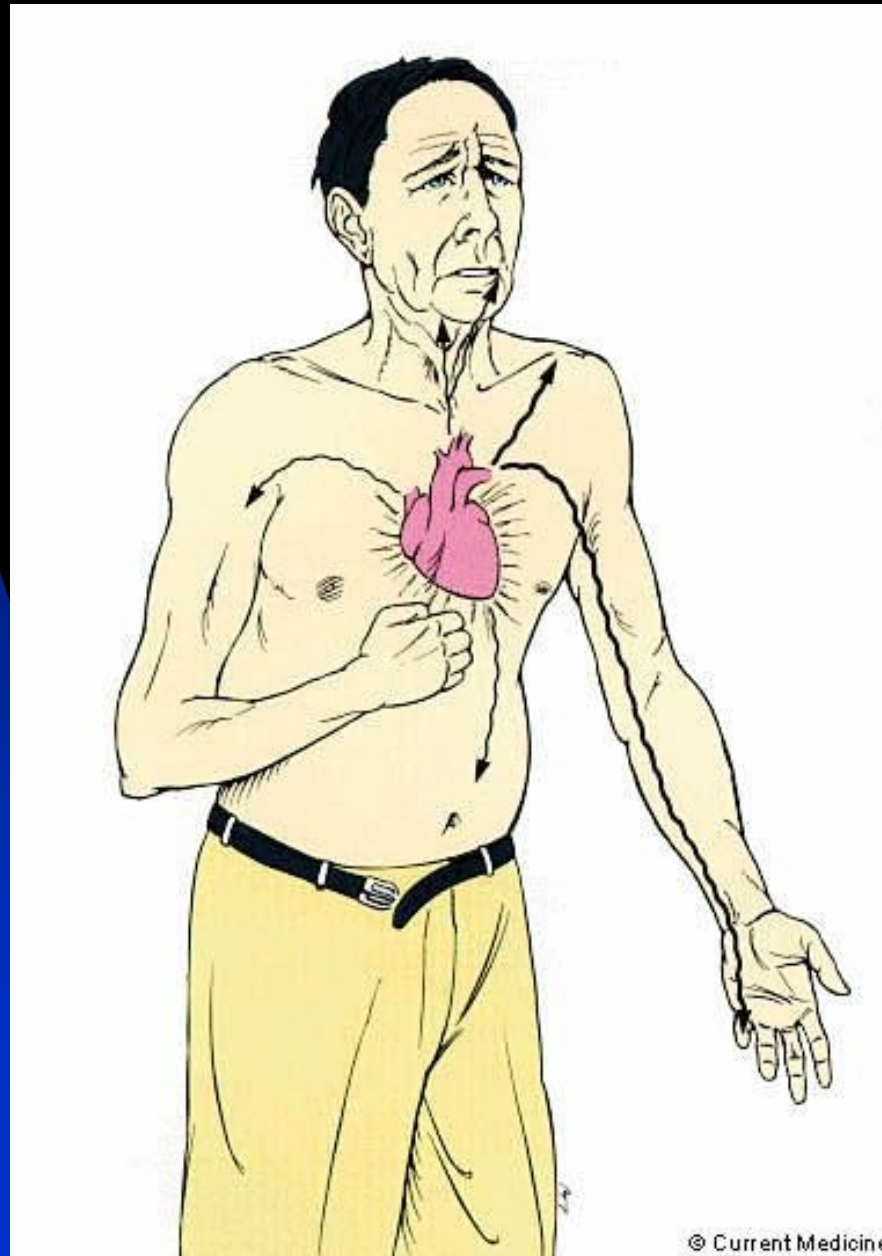# Cardiovascular diseases – epidemiology, risk factors (etiology), prevention

Mortality structure

Digestive 4%

Respiratory 5%

Injuries 7%

Other 6%

Cardio-vascular 52%

Cancer 26%

Severe pain by myocardial infarction
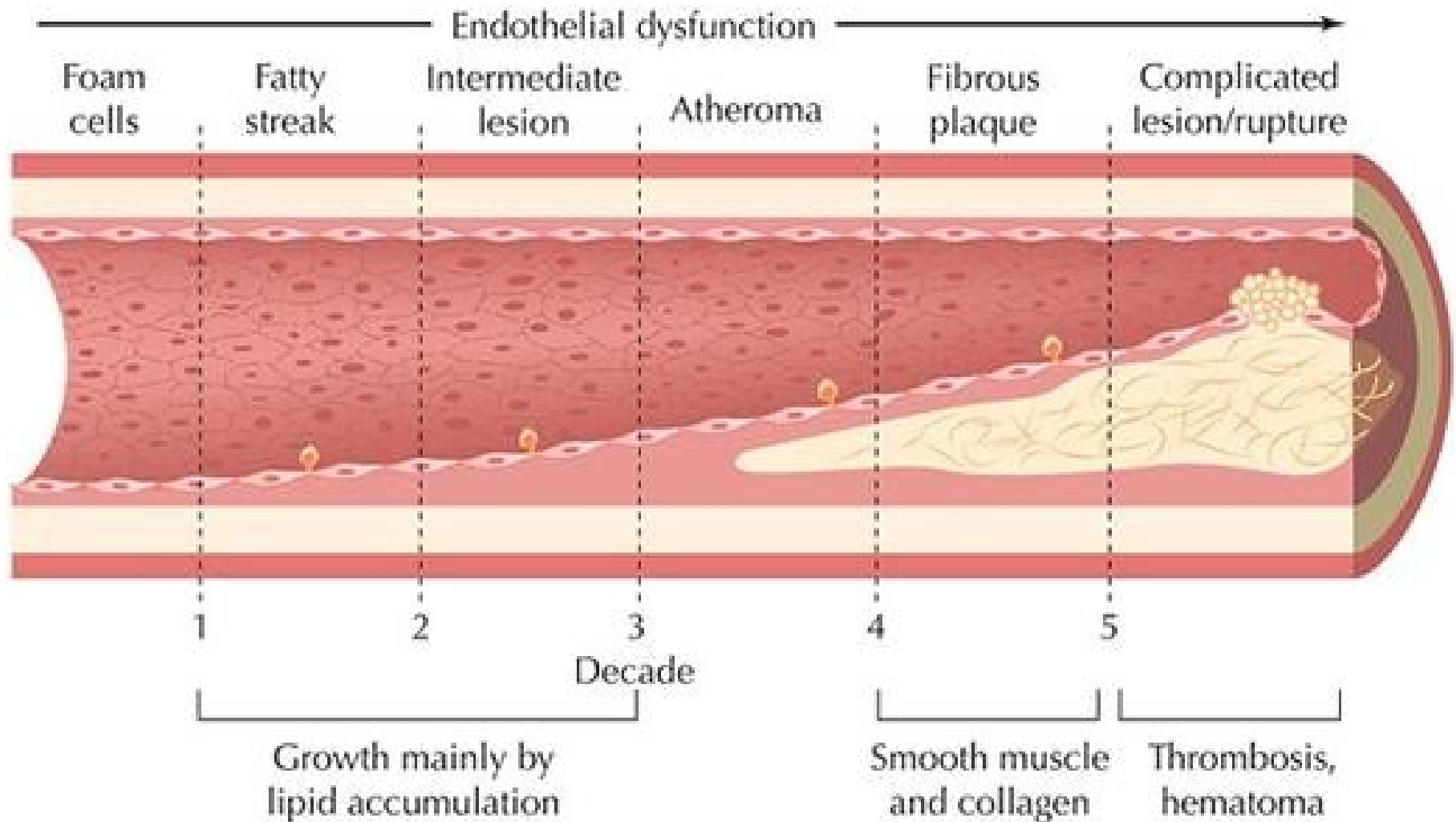

© Current Medicine

Cardiovascular dieseases

Atherosclerosis =

Common denominator, and the principal cause of the main cardiovascular diseases

Clinical consequences of atherosclerosis:

- **Myocardial infarction**

- **Stroke**

Causes of atherosclerosis

Main modifiable risk factors

Lifestyle factors	*Physiologic characteristics*

(Modifiable directly → *(Modifiable undirectly, secondarily)*

Lifestyle factors:

- **Smoking**

- **Diet** - rich in saturated fats, cholesterol and energy

- **Physical inactivity**

- **Alcohol** – high consumption

Physiologic characteristics:

- High blood **Cholesterol**

- High **Blood Pressure**

- **Overweight, obesity**

- **Diabetes, elevated blood sugar**

- **Trombogenic** factors

Smoking

■ The single most important risk factor for cardiovascular diseases (and cancer)

■ Harms even in the smallest dose

■ Basicaly very easy modifiability

Prevention of cardiovascular diseases by diet

- People should be able to choose healthy foods and compose healthy diet for lowering the risk of atherosclerosis

Food, diet and the risk of atherosceloris – what matters:

- **Fats – mainly their composition** (different types of fatty acids):

  - Saturated FA (animal fat in meat, milk fat, coconut…)

  - Unsaturated FA (in plant oils, fish)
    - MUFA – Mono Unsaturated
    - PUFA – Poly Unsaturated FA
    - „Trans" fatty acids (in cheap pastries etc.)

- **Cholesterol in food** (but this is not the most important factor)

- **Too much energy**

- **Protective substances** (phytochemicals)

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Diet for prevention of CVD:

- Diet must be varied

- Energy intake to maintain BMI in the range 18.5 - 25

- Promote the consuption of following foods:
  - Fruits and vegetables
  - Wholegrain cereals and breads
  - Low-fat dairy products

- Fish and omega-3 FA especially protect against CVD

- Fats:
  - Fats should acount for 25-35% of energy intake
  - Saturated – up to 7% of total energy intake
  - Dietary cholesterol < 200mg / day
  - Saturated fats should be replaced by carbohydrates and MUFA+PUFA

The effect of physical activity on cardiovascular risk factors

Lifestyle factors

- **Smoking**

- **Diet** - rich in saturated fats, cholesterol and energy

- **Physical inactivity**

- **Alcohol** – high consumption

Physiologic characteristics

- High blood **Cholesterol**

- High **Blood Pressure**

- **Overweight, obesity**

- **Diabetes,** Glucose intolerance

- **Trombogenic** factors

- **Low cardiorespiratory fitness**

Recommendations of physical activity

■ *Practice physical activity on regular basis:*

Type of activity: Endurance, aerobic

Frequency:
(how often) **Preferably daily**

Length - duration:
(of 1 session) **>30 minutes**

Intensity: **Moderate to Vigorous**
(60-80 % of max. HF)

Max.HF (Heart Frequency) = 220 - age

Blood cholesterol

■ **Total cholesterol (TC)**

$$< 5 \text{ mmol/l, by hi-risk} < 4,5 \text{ mmol}$$

■ **LDL-cholesterol (LDL-C)**

$$< 3 \text{ mmol/l, by hi-risk} < 2,5 \text{ mmol}$$

■ **HDL-cholesterol (HDL-C)**

$$> 1 \text{ mmol/l (the higher, the better)}$$

Body weight, fatness

■ *Maintan the balance between energy intake a output to keep*

BMI 18,5 - 25   *Weight [kg] / (Height)^2 [m]*

Underweight	Normal weight	Overweight	Obesity
< 18,5	18,5 - 25	25 - 30	> 30

Blood pressure

Systolic	Diastolic	Category
< 120	< 80	Optimal
120 - 129	80 - 84	Normal
130 - 139	85 - 89	High normal
> 140	> 90	Hypertension

Cancer

Incidence and mortality according to cancer sites

Developed Countries

Male	Female	Male	Female
Prostate 648,400	Breast 692,200	Lung & bronchus 412,000	Breast 189,500
Lung & bronchus 482,600	Colon & rectum 337,700	Colon & rectum 166,200	Lung & bronchus 188,400
Colon & rectum 389,700	Lung & bronchus 241,700	Prostate 136,500	Colon & rectum 153,900
Urinary bladder 177,800	Corpus uteri 142,200	Stomach 110,900	Pancreas 79,100
Stomach 173,700	Stomach 102,000	Pancreas 82,700	Stomach 70,800
Kidney 111,100	Ovary 100,300	Liver 75,400	Ovary 64,500
Non-Hodgkin lymphoma 95,700	Non-Hodgkin lymphoma 84,800	Urinary bladder 55,000	Liver 39,900
Melanoma of skin 85,300	Melanoma of the skin 81,600	Esophagus 53,100	Leukemia 38,700
Pancreas 84,200	Pancreas 80,900	Leukemia 48,600	Non-Hodgkin lymphoma 33,500
Liver 81,700	Cervix Uteri 76,500	Kidney 43,000	Corpus uteri 33,200
All sites but skin 2,975,200	All sites but skin 2,584,800	All sites but skin 1,528,200	All sites but skin 1,223,200

Causes of cancer

Main risk factors

Environment
90-95%

Genes
5-10%

C

Alcohol
4-6%

Diet
30-35%

Obesity
10-20%

Environment

Infections
15-20%
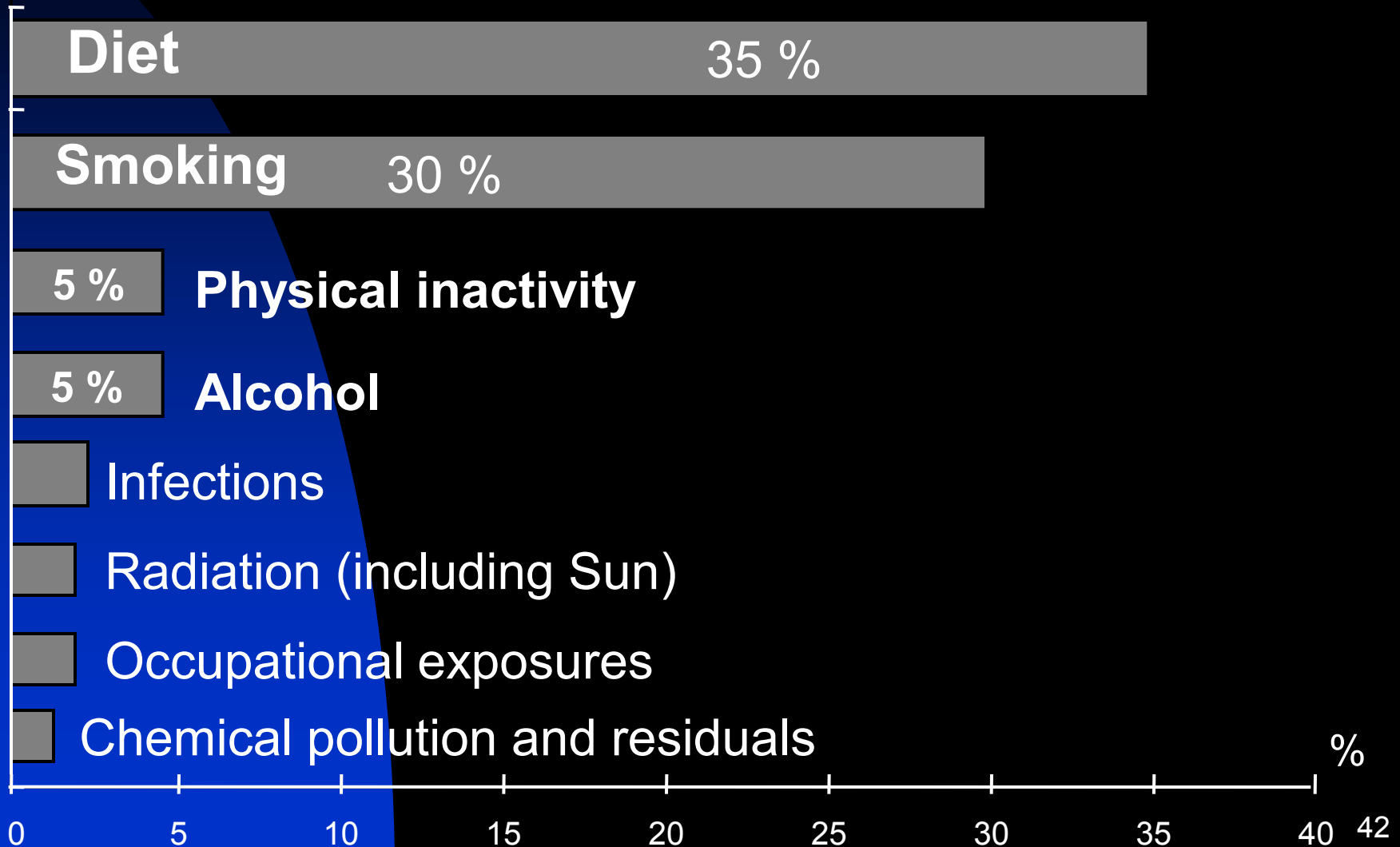
Tobacco
25-30%
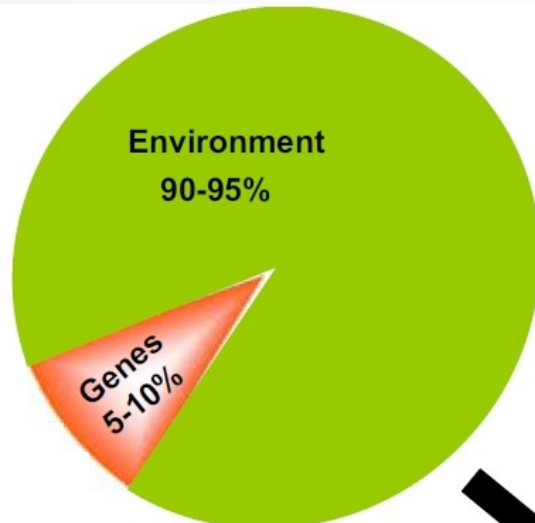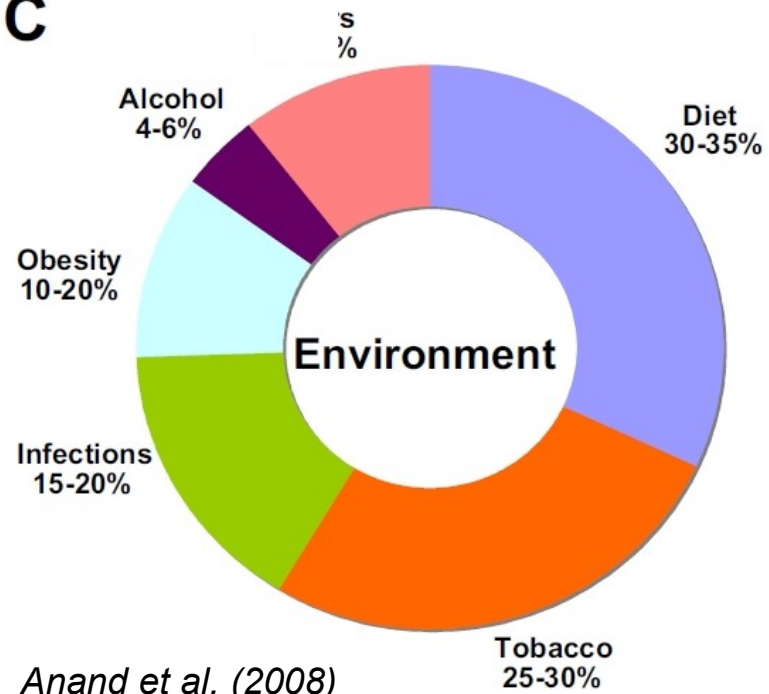
Anand et al. (2008)

Cancer causes
Attributive part of overall cancer mortality

Modifiable factors cause **90-95 % of all cancers**!

Diet — 35 %

Smoking — 30 %

5 % Physical inactivity

5 % Alcohol

Infections

Radiation (including Sun)

Occupational exposures

Chemical pollution and residuals

%

0   5   10   15   20   25   30   35   40   42
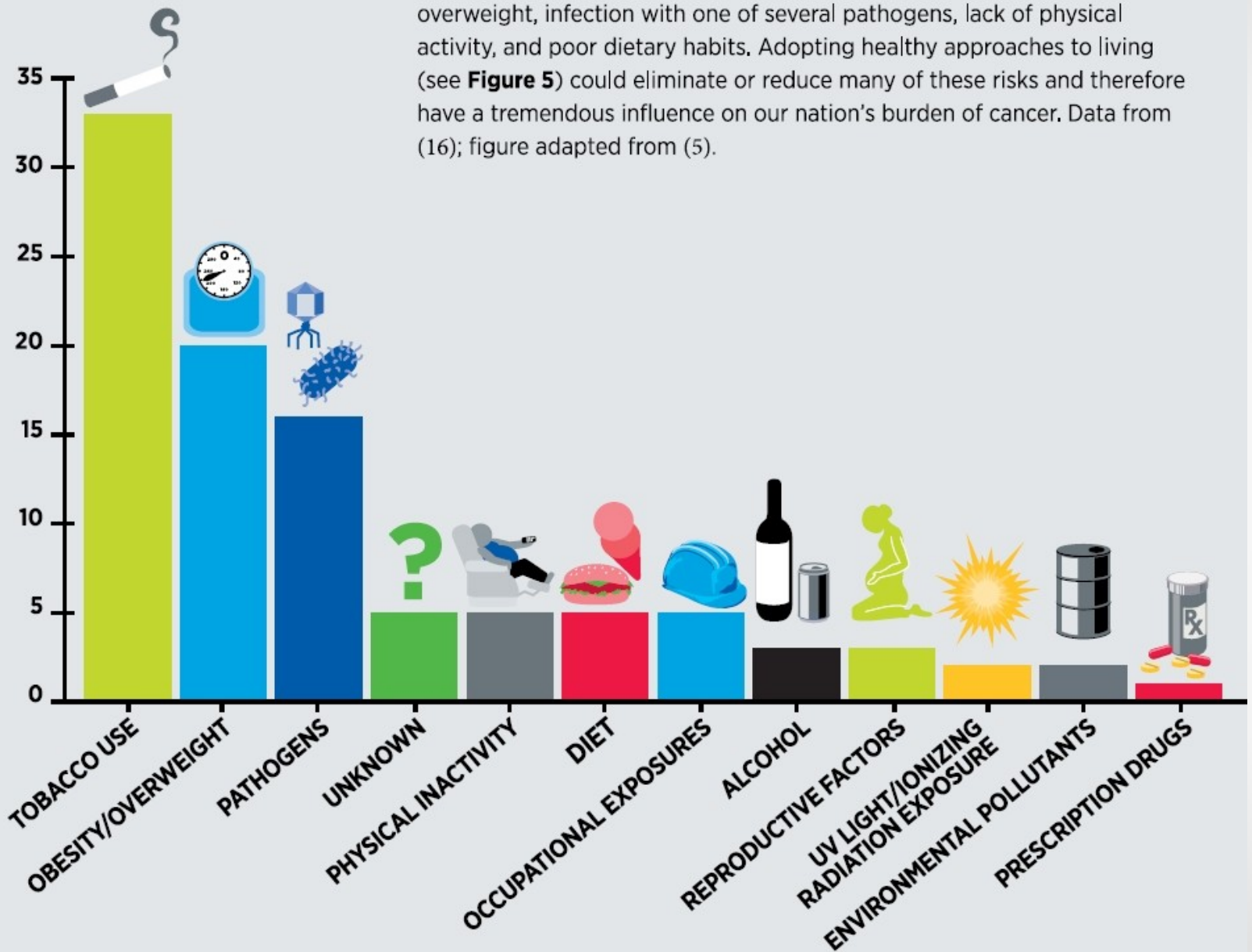
Research has identified numerous factors that increase an individual's risk for developing cancer. Not all factors have the same impact on cancer risk. The factors with the biggest impact are tobacco use, obesity and overweight, infection with one of several pathogens, lack of physical activity, and poor dietary habits. Adopting healthy approaches to living (see **Figure 5**) could eliminate or reduce many of these risks and therefore have a tremendous influence on our nation's burden of cancer. Data from (16); figure adapted from (5).

Smoking and cancer risk

- The most important single cause of cancer

  (It causes approx. 30% of all cancer deaths)

- There are approx. 60 proved human carcinogens in cigarette smoke (!!!)

- Cigarettes classified as Carcinogen class I (=proved human carcinogen)

  And normally, freely being sold ??????

- Provably causes cancer of 19 sites (!!!)

FIGURE 6 | BEYOND THE LUNGS: CANCERS CAUSED BY TOBACCO USE

LUNG AND BRONCHUS

HEMATOPOIETIC SYSTEM
Acute Myeloid Leukemia

UROGENITAL SYSTEM
Kidney

Ureter

Bladder

Ovary

Uterine Cervix

HEAD AND NECK
Larynx

Hypopharynx

Oral Cavity

Oropharynx

Nasal Cavity

Nasopharynx

DIGESTIVE SYSTEM
Esophagus

Stomach

Liver

Pancreas

Colon

1. *Mouth*
2. *Oropharynx*
3. *Nasopharynx*
4. *Hypopharynx*
5. *Oesophagus*
6. *Stomach*
7. *Colorectum*
8. *Liver*
9. *Packreas*
10. *Nasal cavity and paranasal sinuses*
11. *Larynx*
12. *Lung*
13. *Cervix uteri*
14. *Ovarium*
15. *Bladder*
16. *Kidney*
17. *Ureter*
18. *Bone marrow (myeloid leukemia)*
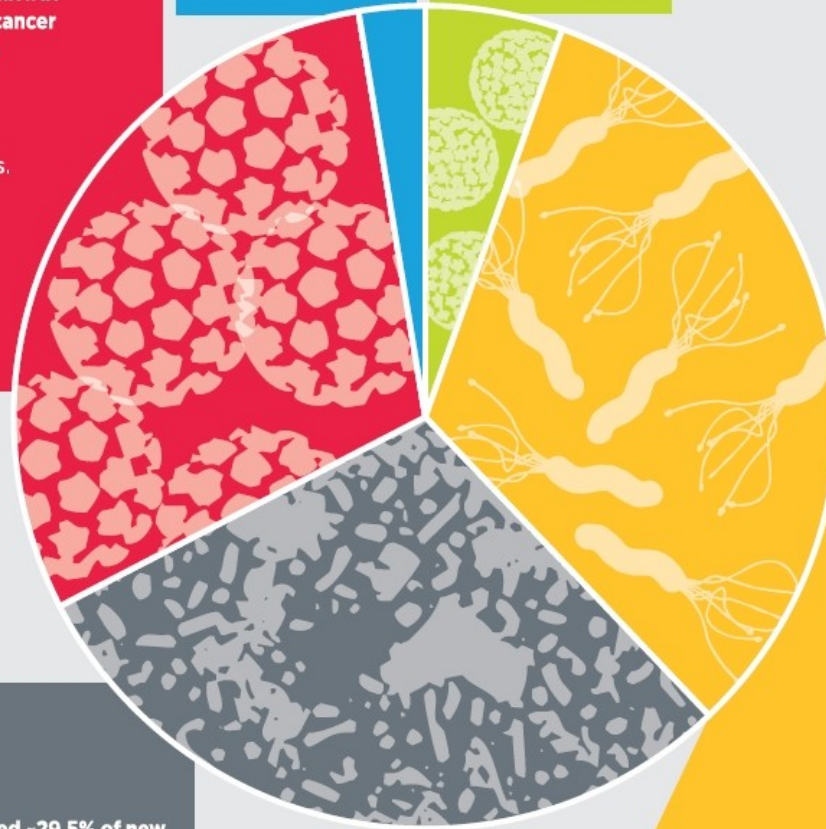19. *Breast (limited evidence)*

HPV
30.0%

12 strains of human papillomavirus (HPV) caused ~30% of new cancer cases attributed to infection globally in 2008.

In the United States:
~96% of cervical cancer cases.
~51% of vulvar cancers.
~64% of vaginal cancers.
~36% of penile cancers.
~93% of anal cancers.
~63% of oropharyngeal head and neck cancers.

Other Agents
2.6%

Epstein-Barr Virus (EBV)
5.4%

HBV and HCV
29.5%

HBV and HCV infection caused ~29.5% of new cancer cases attributed to infection globally in 2008.

Hepatitis B virus (HBV):
Causes ~45% of of liver cancer deaths worldwide.

Over 700,000 individuals in the United States are estimated to be infected with HBV.

Hepatitis C virus (HCV):
Causes ~25% of liver cancer deaths worldwide.
~2.7 million individuals in the United States are infected with HCV and unaware.

Helicobacter pylori
32.5%

Helicobacter pylori causes:

~32.5% of new cancer cases attributed to infection globally in 2008.

~90% of lower gastric (stomach) cancers.

~86% of cases of gastric mucosa-associated lymphoid tissue (MALT) lymphoma.

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REASONS TO PROTECT YOUR SKIN

Exposure to ultraviolet (UV) radiation from the sun, sunlamps, sunbeds, and tanning booths is the predominant cause of the three main types of skin cancer.

UV

Melanoma incidence rates have been on the rise for at least 30 years (1).

INCIDENCE

More than 85 percent of all skin cancers are estimated to be due to UV radiation exposure from the sun (31, 32).

85% SKIN CANCERS

Use of a UV indoor tanning device increases melanoma risk by 20 percent, and each additional use increases risk a further 1.8 percent (34).

20%

In the United States, 8 percent of all melanoma cases each year have been attributed to indoor tanning (33).

8% MELANOMA CASES

Regular, daily use of sunscreen (sun protection factor [SPF] of 15 or higher) reduces an individual's risk of developing squamous cell carcinoma and melanoma by 40 percent and 50 percent, respectively (35, 36).
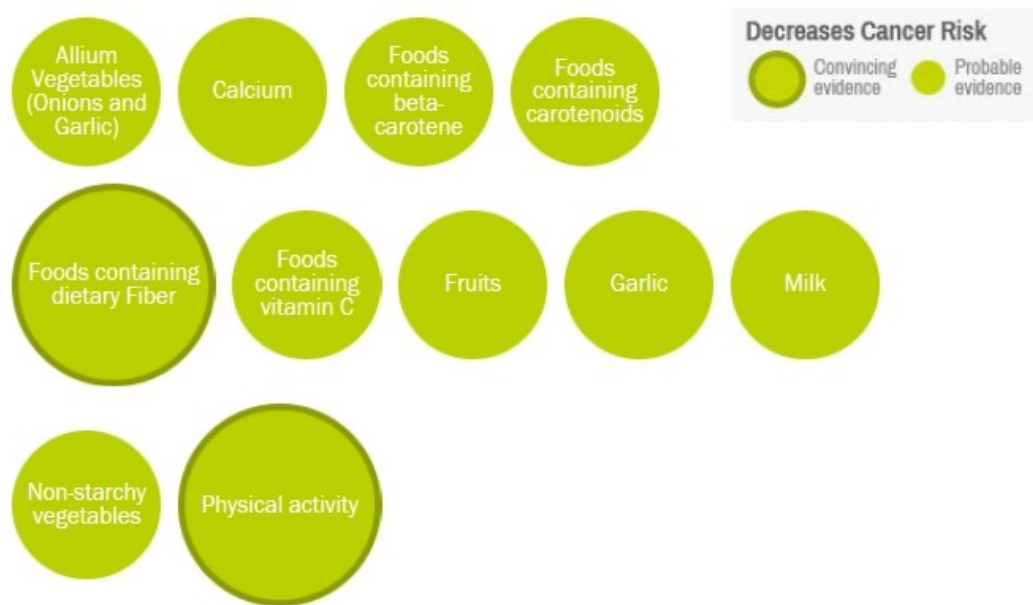
SPF 15+

Diet and the risk of cancer

Summary I – dietary factors with **CONVINCING** evidence of effect on cancer risk:

Factor:	DECREASES RISK for cancer site:	INCREASES RISK for cancer site:
Aflatoxins		Liver
Red meat, processed meat		Colorectum
Alcoholic drinks		Mouth, pharynx, larynx, oesophagus, colorectum (♂), breast (♀)
Body fatness		Oesophagus, pancreas, colorectum, breast (postmeno), edometrium, kidney

Summary II – dietary factors with **PROBABLE** evidence:

Factor:	DECREASES RISK for cancer site:	INCREASES RISK for cancer site:
Foods containing **Dietary fibre**	*Colorectum*	
Non-starchy vegetables	*Mouth, pharynx, larynx, oesophagus, stomach*	
Allium vegetables	*Stomach*	
Garlic	*Colorectum*	
Fruits	*Mouth, pharynx, larynx, oesphagus, stomach, lung*	
Foods cont. **Folates**	*Pancreas*	
Foods cont. **Karotenoids**	*Mouth, pharynx, larynx, lung*	
Foods cont. **Beta-carotene**	*Oesophagus*	
Foods cont. **Lycopene**	*Prostate*	
Foods cont. **Vitamin C**	*Oesophagus*	
Foods cont. **Selenium**	*Prostate*	
Milk Diets high in **Calcium**	*Colorectum*	*Prostate*
Salt, salted and salty foods		*Stomach*
Alcoholic drinks		*Liver, colorectum (♀)*
Calcium (supplement) **Selenium** (supplement)	*Colorectum* *Prostate*	
Body fatness		*Gallbladder*

Decreases Cancer Risk
- Convincing evidence
- Probable evidence

Allium Vegetables (Onions and Garlic)

Calcium

Foods containing beta-carotene

Foods containing carotenoids

Foods containing dietary Fiber

Foods containing vitamin C

Fruits

Garlic

Milk

Non-starchy vegetables

Physical activity

Common Cancers

Increases Cancer Risk
- Convincing evidence
- Probable evidence

Alcoholic drinks

Beta-carotene supplements

Excess Body Fat

Processed meat

Red meat

Salt and salty foods

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And what is without any substantial effect on cancer risk (both adverse or favourable:

- „E-numbers" in food

- Pesticide and other chemicals residuals in food

- Artificial sweeteners

- Green tea, black tea

- Coffee

- Suplemments, pills againts cancer (vitamin etc.)

- Organic food (no other effect on cancer than normal foods)

Physical activity

Evidence	DECREASES RISK		INCREASES RISK	
	Exposure	*Cancer site*	*Exposure*	*Cancer site*
Convincing:	Physical activity	Colon		
Probable:	Physical activity	Breast (post-meno), endometrium		

REASONS TO MAINTAIN A HEALTHY WEIGHT AND KEEP ACTIVE

33%
CANCER CASES

About one in every three new cases of cancer diagnosed in the United States is related to being overweight or obese, being inactive, and/or eating poorly (10, 16).

The adenocarcinoma subtype of esophageal cancer, colorectal, endometrial, gallbladder, kidney, pancreatic, and postmenopausal breast cancers have been causally linked to being overweight or obese (10).
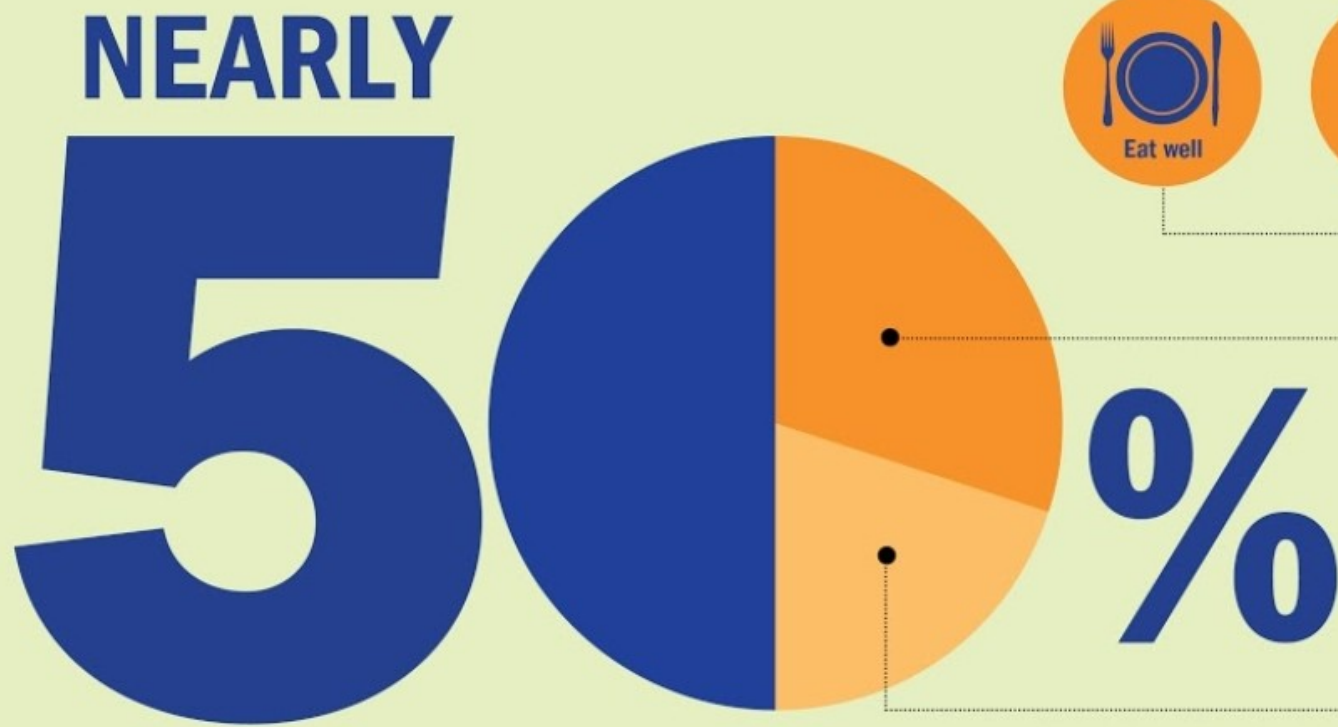
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TYPES OF CANCER

Regular physical activity can decrease an individual's risk of developing colon, endometrial, and postmenopausal breast cancers (23).

Sedentary behavior may increase the risk for developing colorectal, endometrial, ovarian, and prostate cancers (24).

RISK OF DEATH

Obesity, lack of regular physical activity, and sedentary behavior are linked to worse outcomes, including increased risk for death, for patients with a number of types of cancer.

NEARLY

50%

of the most common cancers CAN BE PREVENTED

Eat well

Stay lean

Move more

Don't smoke

Protect your skin

Get vaccinated

SOURCES: Colditz GA et al. Sci Transl Med. Applying what we know to accelerate cancer prevention. Sci Transl Med. 2012 Mar 28;4(127); AICR/WRCF's, *Food, Nutrition, Physical Activity and the Prevention of Cancer: a Global Perspective* (2007), *Policy and Action for Cancer Prevention* (2009), Continuous Update Project reports (ongoing).