

# Epidemiology and Risk Factors for Cardiovascular Disease (CVD)

# □ (CVD)

**Mortality: Leading cause of mortality in developed countries** and a rising tendency in developing countries (disease of civilization)

A major impact on life expectancy

Significantly contributes to morbidity and death rates in the middle aged population: potential life years lost, common cause of premature death, labor force (economic costs).

**Morbidity: nearly 30% of all disability cases**

Contributes to deterioration of the Quality Of Life (QOL)

- 1. Coronary heart disease (CHD, ischemic heart disease, heart attack, myocardial infarction, angina pectoris)**
- 2. Cerebrovascular disease (stroke, transient ischemic attack (TIA))**
- 3. Hypertensive heart disease**
- 4. Peripheral vascular disease**
- 5. Heart failure**
- 6. Rheumatic heart disease**
- 7. Congenital heart disease**
- 8. Cardiomyopathies**

# **Epidemiology & CVD**

**Study of the natural history of CVD**

**Formulation and testing of etiological hypotheses (risk factors)**

**Contribution to the development of cardiovascular prevention programs and the measurement of their effectiveness**

## 1. Descriptive epidemiology:

= Describing distribution of CVD by means of certain characteristics such as : PERSON (i.e., age, gender, ethnicity) TIME and PLACE

## 2. Analytic epidemiology

= Analyzing relationships between CVD and risk factors (which elevate the probability of a disease at population level), risk model and multicausal developments

## 3. Experimental epidemiology/Interventions

= Strategies of cardiovascular prevention (**primordial\***, primary, secondary, tertiary; individual and community levels)

**\*Primordial prevention is defined as prevention of risk factors themselves: health education to children.**

**Levels of prevention**

**Phase of disease**

**Target**

Primordial

Underlying conditions leading to causation

Total population and selected groups

Primary

Specific causal factors

Total population, selected groups and healthy individuals

## **Levels of prevention**

## **Phase of disease**

## **Target**

Secondary

Early stage of disease

Patients

Tertiary

Late stage of disease (treatment, rehabilitation)

Patients

# Distribution Patterns in the World

Cardiovascular diseases (CVDs) are the leading cause of death globally.

An estimated 17.9 million people died from CVDs in 2019, **representing 32% of all global deaths**. Of these deaths, 85% were due to heart attack and stroke.

Over three quarters of CVD deaths take place **in low- and middle-income countries**.

Out of the 17 million premature deaths (under the age of 70) due to non-communicable diseases in 2019, **38% were caused by CVDs**.

Most cardiovascular diseases can be **prevented by addressing behavioural risk factors such as tobacco use, unhealthy diet and obesity, physical inactivity and harmful use of alcohol**.

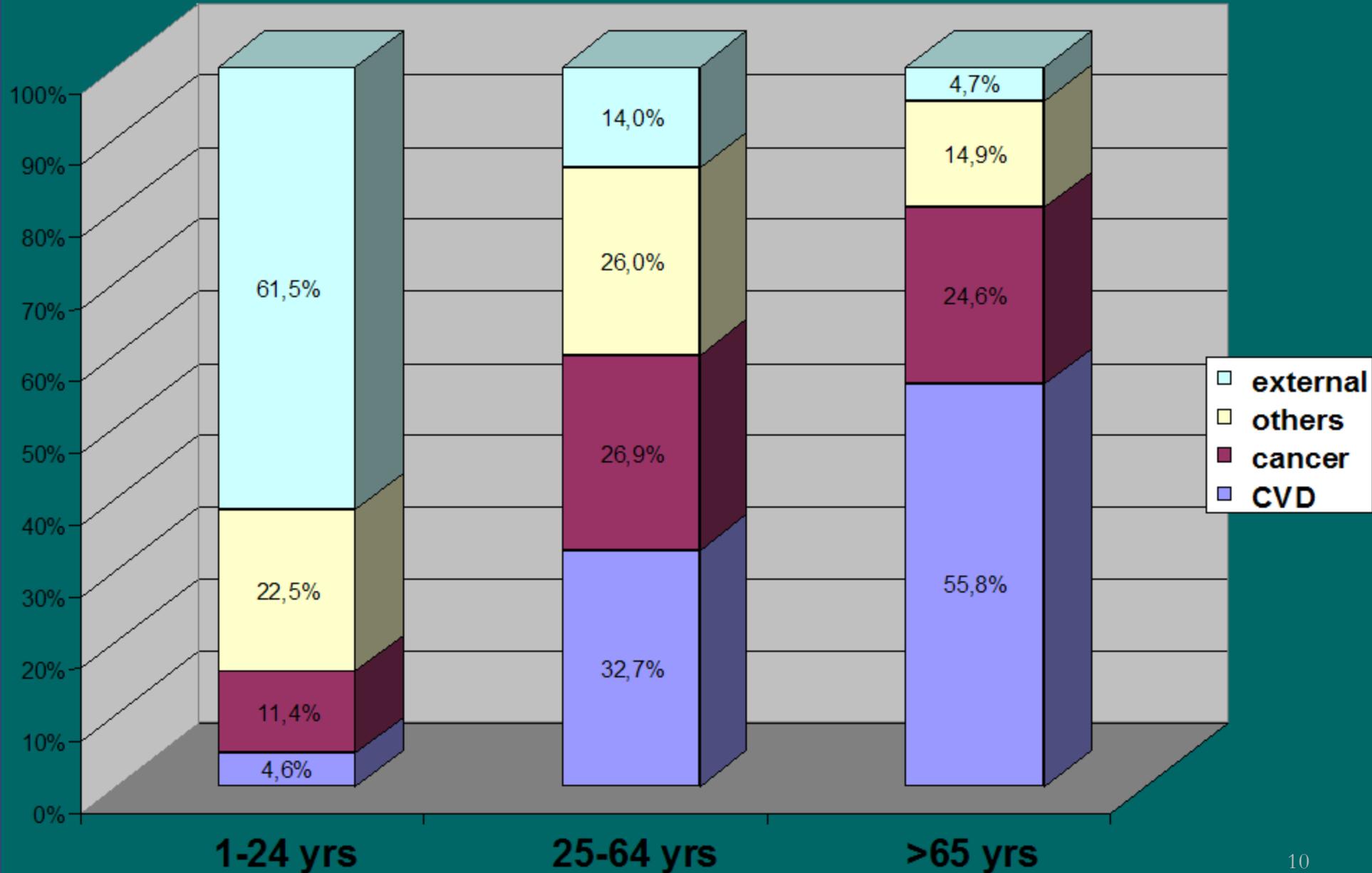
**Question: What is the relative amount of CVD in death rates in different age groups?**

**Early lesions of blood vessel, atherosclerotic plaques: around 20 years - adult lifestyle patterns usually start in childhood and youth (smoking, dietary habits, sporting behavior, etc.)**

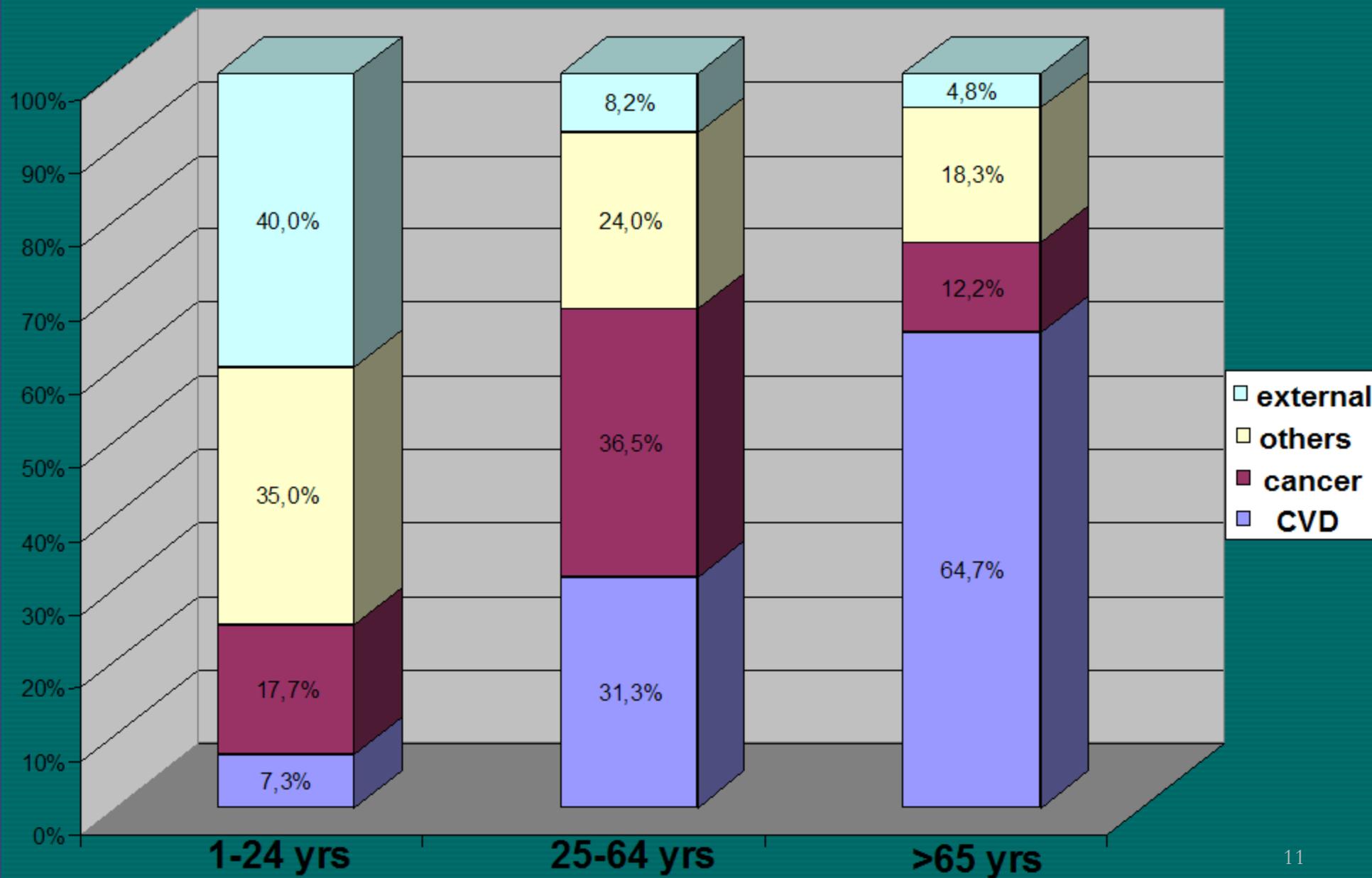
**Increase in CVD morbidity and mortality: in age-group of 30-44 years**

**Premature death (<64 years of age, or 25-64 years)**

# PROPORTION OF MORTALITY IN DIFFERENT AGE-GROUPS (MEN)



# PROPORTION OF MORTALITY IN DIFFERENT AGE-GROUPS (WOMEN)



**Question: What is the relative amount of CVD in death rates in women and men?**

**Widespread idea: CVD is often thought to be a disease of **Middle-aged Men.****

**Cardiovascular mortality (**fatal cases**) are more common among men.**

**Gender-specific risk factors (risks for women only) (oral contraceptives, hormone replacement therapy (HRT), polycystic ovary syndrome)**

Question: What is the relative amount of CVD in death rates in different ethnic groups?

In the US: increased CVD deaths in **African-American** and South-Asian populations in comparison with **Whites**

Migration: Ni-Hon-San Study: Japanese living in **Japan** had the lowest rates of CHD and cholesterol levels, those living in **Hawaii** had intermediate rates for both, those living in **San Francisco** had the highest rates for both

**Question: What is the relative amount of CVD in different geographical places?**

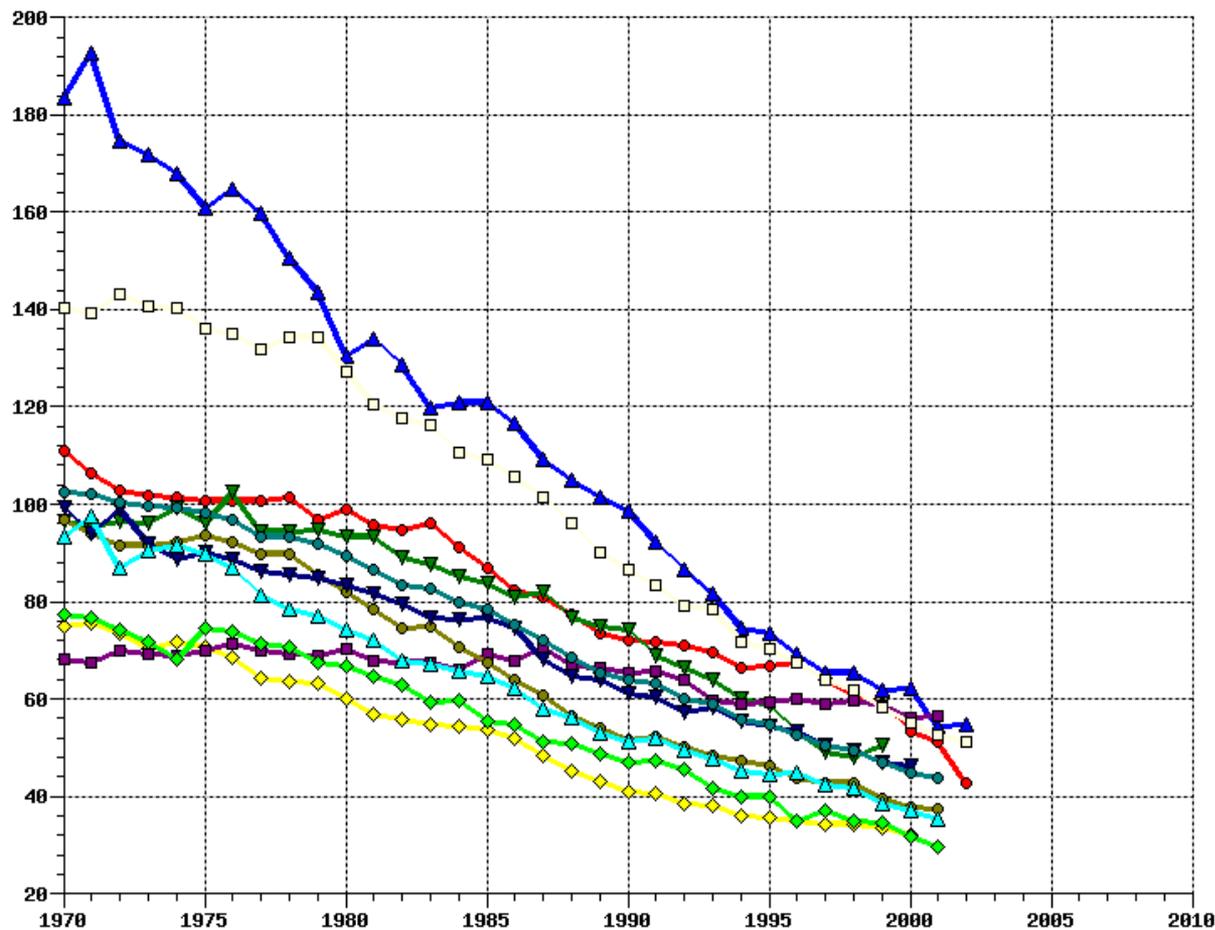
**What are the time trends? International and regional characteristics of distribution**

**SDR: Standardized Death Rate**

**Direct mode of standardization, using the age distribution of a **Hypothetical European Standard Population****

- ❖ **Developed countries: decreasing tendencies**  
(e.g, USA: 30% between 1988-98, Sweden: 42%)
  1. **Improvement of lifestyle factors**, for example, a decrease of smoking and a higher level of health consciousness in many developed countries
  2. **Better diagnostic and therapeutic procedures**  
(e.g., bypass surgeries, hypertension screening, pharmacological treatment of hypertension and hypercholesterinaemia, access to health care)
- ❖ **Developing countries: increasing tendencies**
  - ✓ increasing longevity, urbanization, and western type lifestyle

# SDR, diseases of circulatory system in Western Europe, 0-64 yrs, per 1000000



—●— Austria

—▽— Denmark

—△— Finland

—◇— France

—□— Greece

—○— Italy

—▽— Netherlands

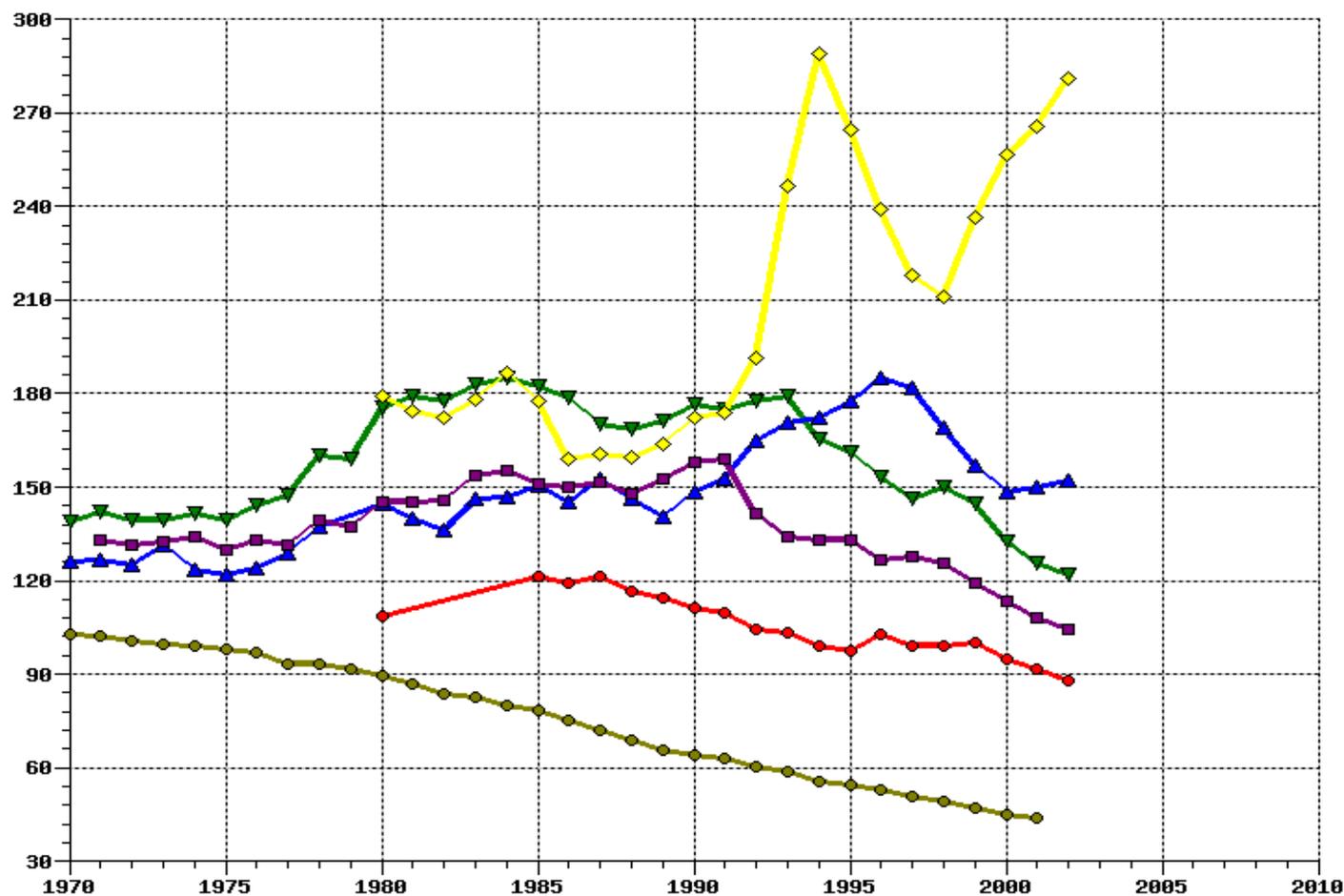
—△— Spain

—◇— Switzerland

—□— United Kingdom

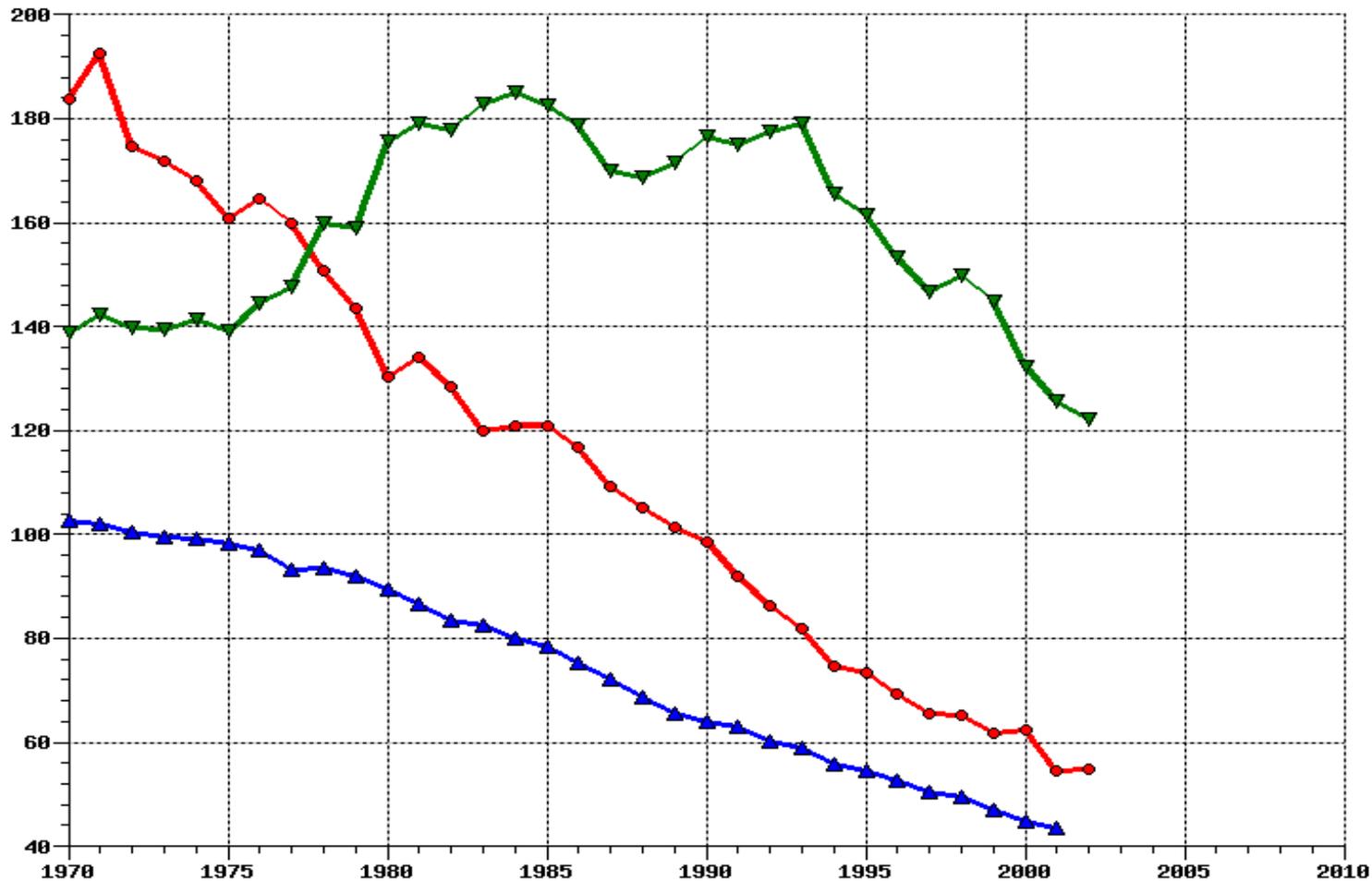
—○— EU-15 average

# SDR, diseases of circulatory system in Eastern Europe, 0-64 yrs, per 1000000



**Croatia**  
●  
**Hungary**  
▼  
**Romania**  
▲  
**Russian Federation**  
◆  
**Slovakia**  
■

# SDR, diseases of circulatory system in Hungary, 0-64 yrs, per 1000000



Finland



Hungary



EU-15  
average



- ✓ Over 300 risk factors have been associated with coronary heart disease, hypertension and stroke
- ✓ Approx. 75% of CVD can be attributed to **conventional risk factors** عوامل الخطر التقليدية
  1. Risk factors of great public health significance:
  2. High prevalence in many populations
  3. Great independent impact on CVD risk
  4. Their control and treatment result in reduced CVD risk
- ✓ Developing countries: double burden of risks (problems of **undernutrition and infections + CVD risks**)

***Major modifiable risk factors***

1. High blood pressure
2. Abnormal blood lipids
3. Tobacco use
4. Physical inactivity
5. Obesity
6. Unhealthy diet
7. Diabetes mellitus

***Other modifiable risk factors***

1. Low socioeconomic status
2. Mental ill health (depression)
3. Psychosocial stress
4. Heavy alcohol use
5. Use of certain medication
6. Lipoprotein(a)

***Non-modifiable risk factors***

1. Age
2. Heredity or family history
3. Gender
4. Ethnicity or race

***"Novel" risk factors***

1. Excess homocysteine\* in blood
2. Inflammatory markers (C-reactive protein)
3. Abnormal blood coagulation (elevated blood levels of fibrinogen)

\*a plasma homocysteine level less than 10 micromoles/L is associated with a lower risk of CVD.

- Systolic blood pressure** >140 Hgmm and/or a diastolic blood pressure > 90 Hgmm
- Positive family history**
- Dietary habits** (a high intake of salt, processed food, low levels of water hardness, high tyramine content of food, alcohol use)
- Modern lifestyle** (increased sympathetic activity, psychosocial stress, leading position in job)

# Tyramine



R  
I  
C  
H  
  
F  
O  
O  
D  
S

# Cholesterol:

structure and functioning of blood vessels,  
atherosclerotic plaques

Altering functions of cholesterol fractions

(LDL:  risk, HDL: protection)

Estrogen: tends to raise HDL and lower LDL,  
protection for women in reproductive age

	<b>European guidelines</b>	<b>US guidelines</b>
<b>Total cholesterol</b>	<5.0 mmol/l	<b>&lt;240 mg/dl (6.2 mmol/l)</b>
<b>LDL-cholesterol</b>	<3.0 mmol/l	<b>&lt;160 mg/dl (3.8 mmol/l)</b>
<b>HDL-cholesterol</b>	>=1.0 mmol/l (men) >=1.2 mmol/l (women)	<b>&gt;=40 mg/dl (1 mmol/l)</b>
<b>Triglycerides (fasting)</b>	<1.7 mmol/l	<b>&lt;200 mg/dl (2.3 mmol/l)</b>

- The link between **Smoking and CVD** (mainly CHD) was identified in 1940
- Greatest risk: initiation **< 16 years**
- **Passive smoking: additional risk**
- Women smokers: are at higher risk of CHD and CVD than male smokers
- Several mechanisms: **damages the endothelium lining, increases atherosclerotic plaques, raises LDL and lowers HDL, promotes artery spasms, raises oxygen demand of the heart muscle**
- Nicotine accelerates the heart rate (RR), and raises blood pressure

**Regular Physical Activity: protective factor**

**Physical activity: helps reduce stress,  
anxiety and depression**

**Intensity and duration (150 minutes/week  
intermediate or 60 minutes/week heavy)**

**\*Modernization, Urbanization,**

**Mechanized Transport:**

**Sedentary Lifestyle (60% of global population)**

- **Raises CVD risk and also the development of other risk factors (diabetes mellitus, blood coagulation, obesity, hypertension)**

- **Body Mass Index (BMI):** > 25: overweight, > 30: obesity
- A **modern "epidemic"**: More than 60% of adults in the US are overweight or obese, in China: 70 million overweight people
- **Elevates the risk of both CVD and diabetes mellitus**
- **Diabetes mellitus: damages both peripheral and coronary blood vessels**
- **Unhealthy diet: low fruit and vegetable, low fiber content, and high saturated fat intake, refined sugar**

- ❑ - Psychological factors (**Type A behavior, hostility**)
- ❑ - **Depression** and CVD: **bidirectional link**
  - ❑ depression may increase the risk of CVD and worsen recovery process
  - ❑ CVD may induce depression
  - ❑



- **Low socioeconomic status (SES):**

**in developing countries: less educated and lower SES groups (accumulation of risk factors)**

# Prevention

**Primordial:** Social, legal and other (often nonmedical) activities which may lead to a lowering of risk factors (e.g., socioeconomic development, smoke-free restaurants)

**Primary:** Controlling risk factors contributing to CVD (health education programs, anti-smoking campaign, sports programs, nutrition counselling, regular check of blood pressure and certain blood parameters, e.g., cholesterol, blood lipids, glucose)

**Secondary:** Screening and treatment of symptomatic patients, set up personal risk profile

**Tertiary:** Cardiovascular rehabilitation, prevention of recurrence of CVD (new heart attack: 5-7 times higher risk among CVD patients)