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

In the world: CVD deaths account for one third of all deaths (25-50% depending on the level of economic development) among which 50%: coronary deaths

CVD made up 16.7 million of global deaths in 2002, among which 7 million due to coronary heart disease, 6 million due to stroke

Distribution of types of CVD in global deaths :

Global cardiovascular deaths in 2002: 16.7 million

among which: coronary heart disease 7.2 million, stroke 6.0 million, 0.9 million hypertensive heart disease, 0.4 million inflammatory heart disease, 0.3 million rheumatic heart disease, 1.9 million other CVD

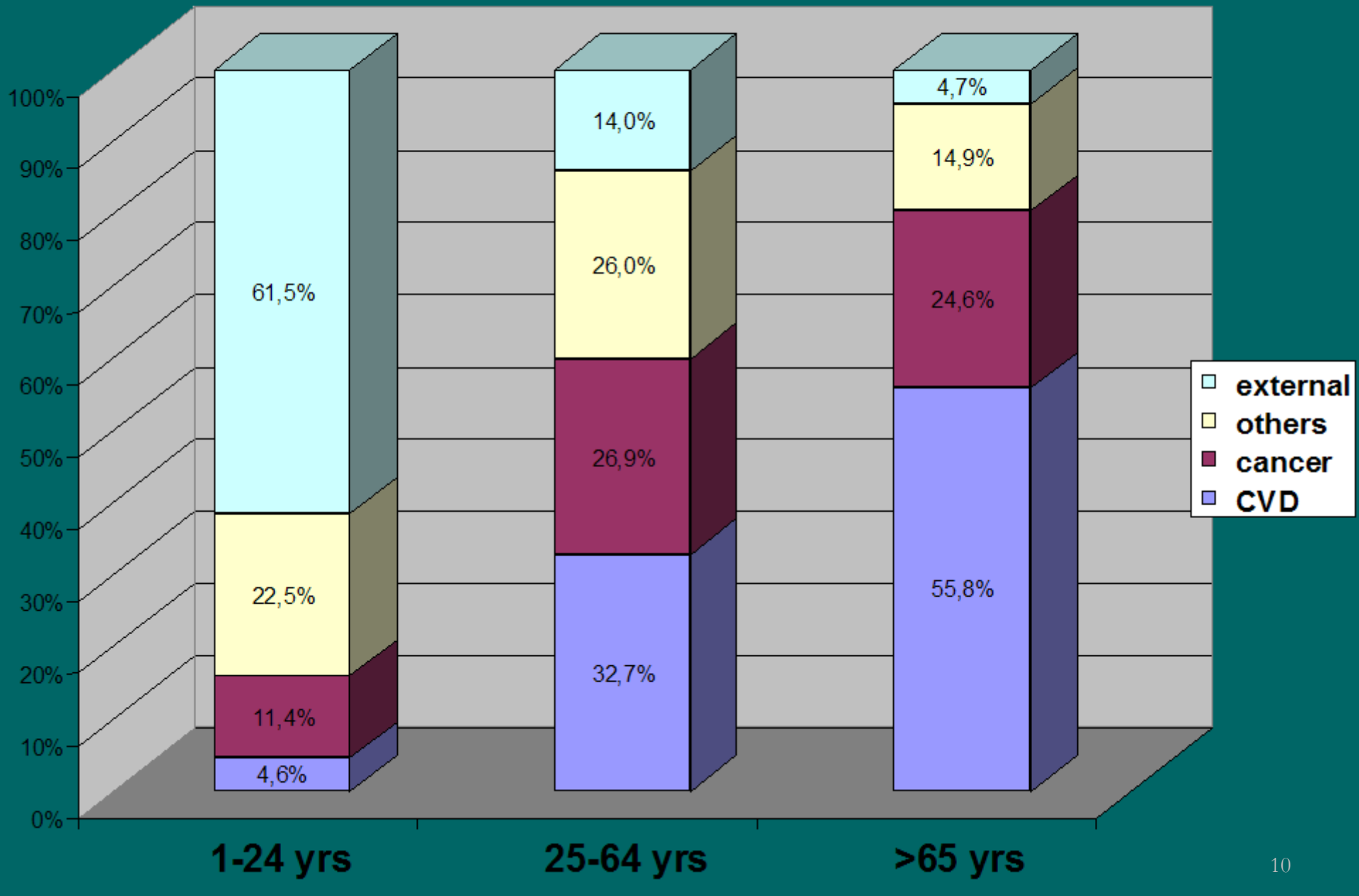
Question: What is the relative amount of CVD in death rates in different age groups?

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.)

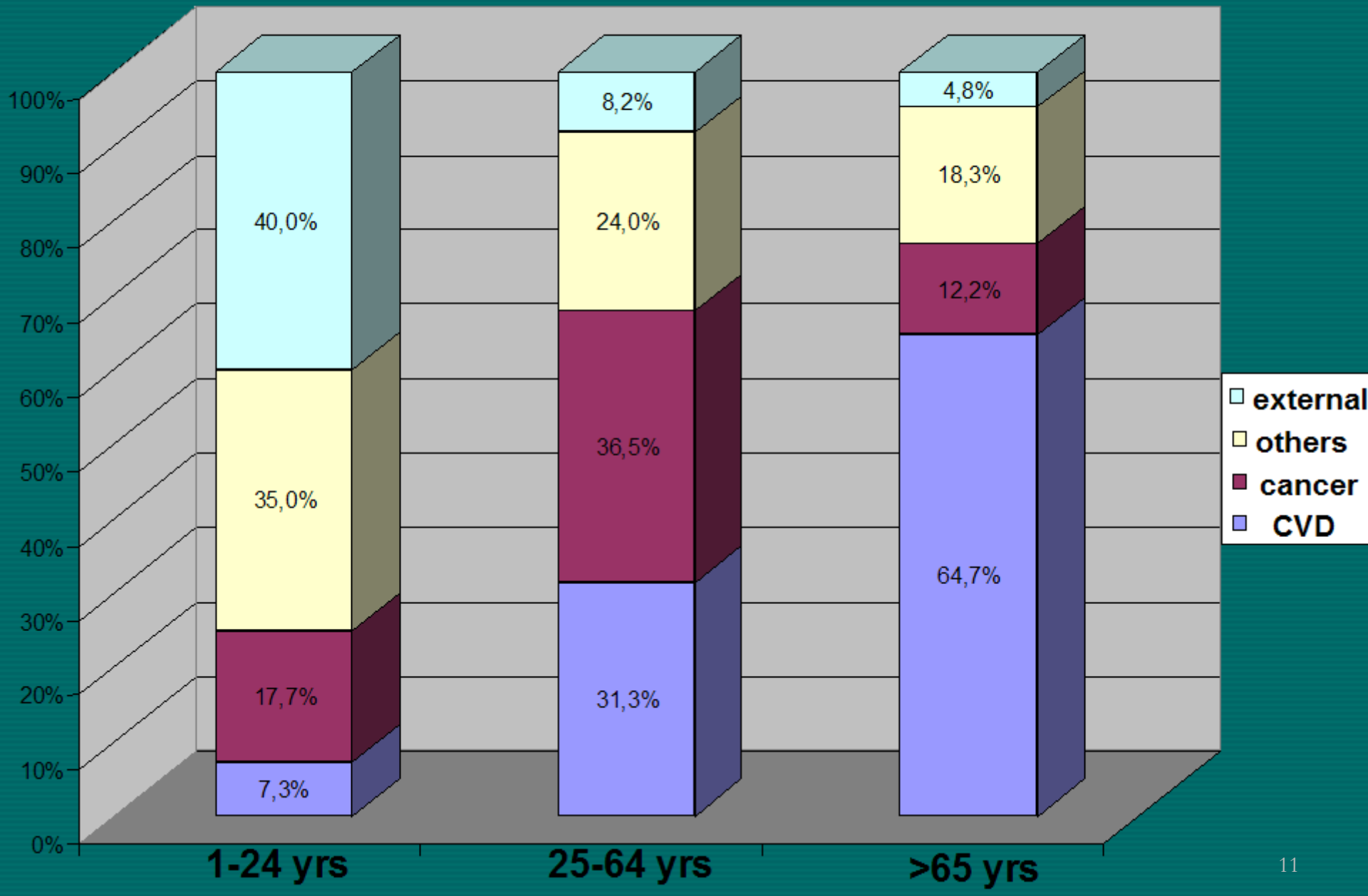
Increase in CVD morbidity and mortality: in age-group of 30-44 years

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

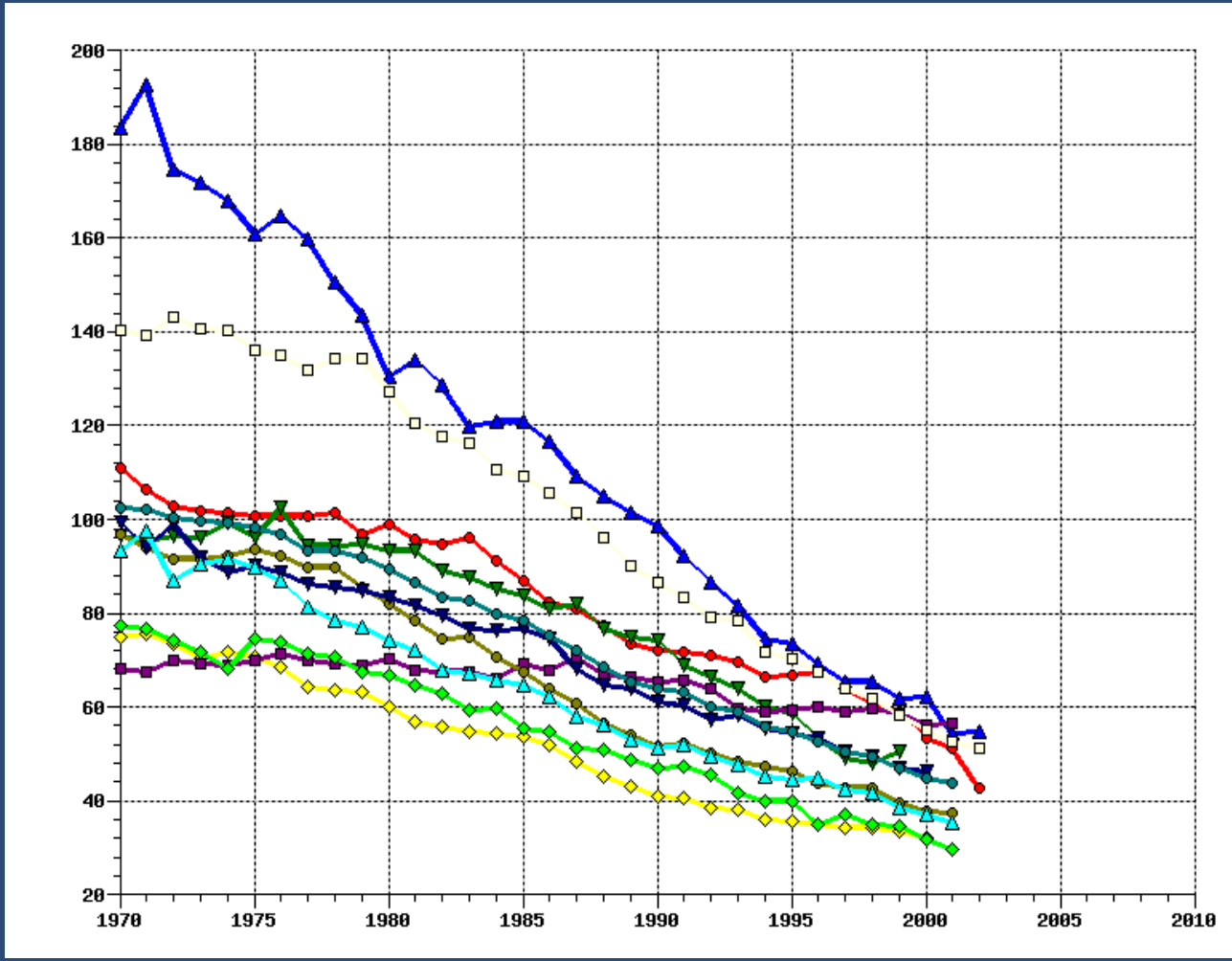
- **Developed countries: decreasing tendencies (e.g, USA: 30% between 1988-98, Sweden: 42%)**

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)**

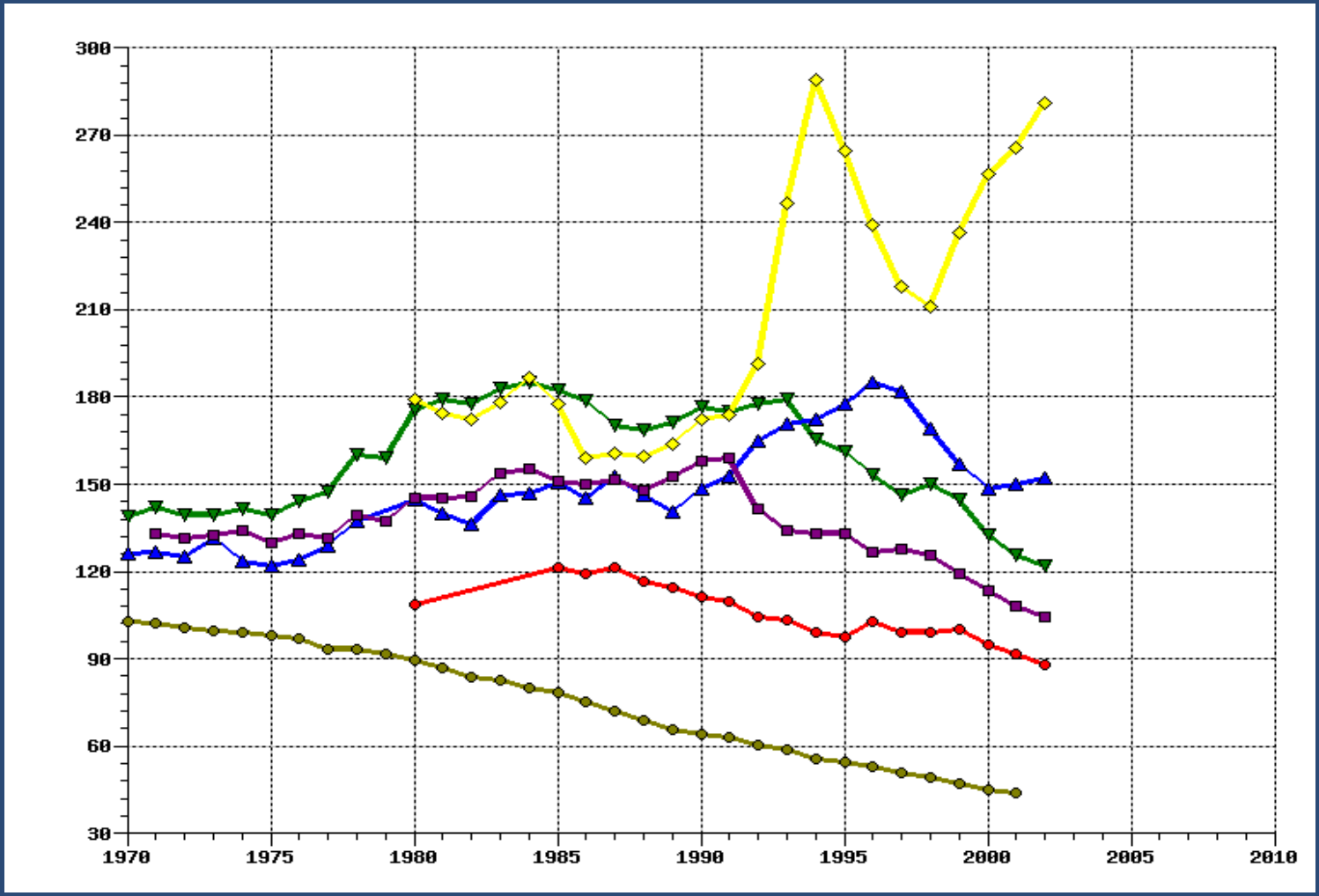
- **Developing countries: increasing tendencies**

✓ **increasing longevity, urbanization, and western type lifestyle**

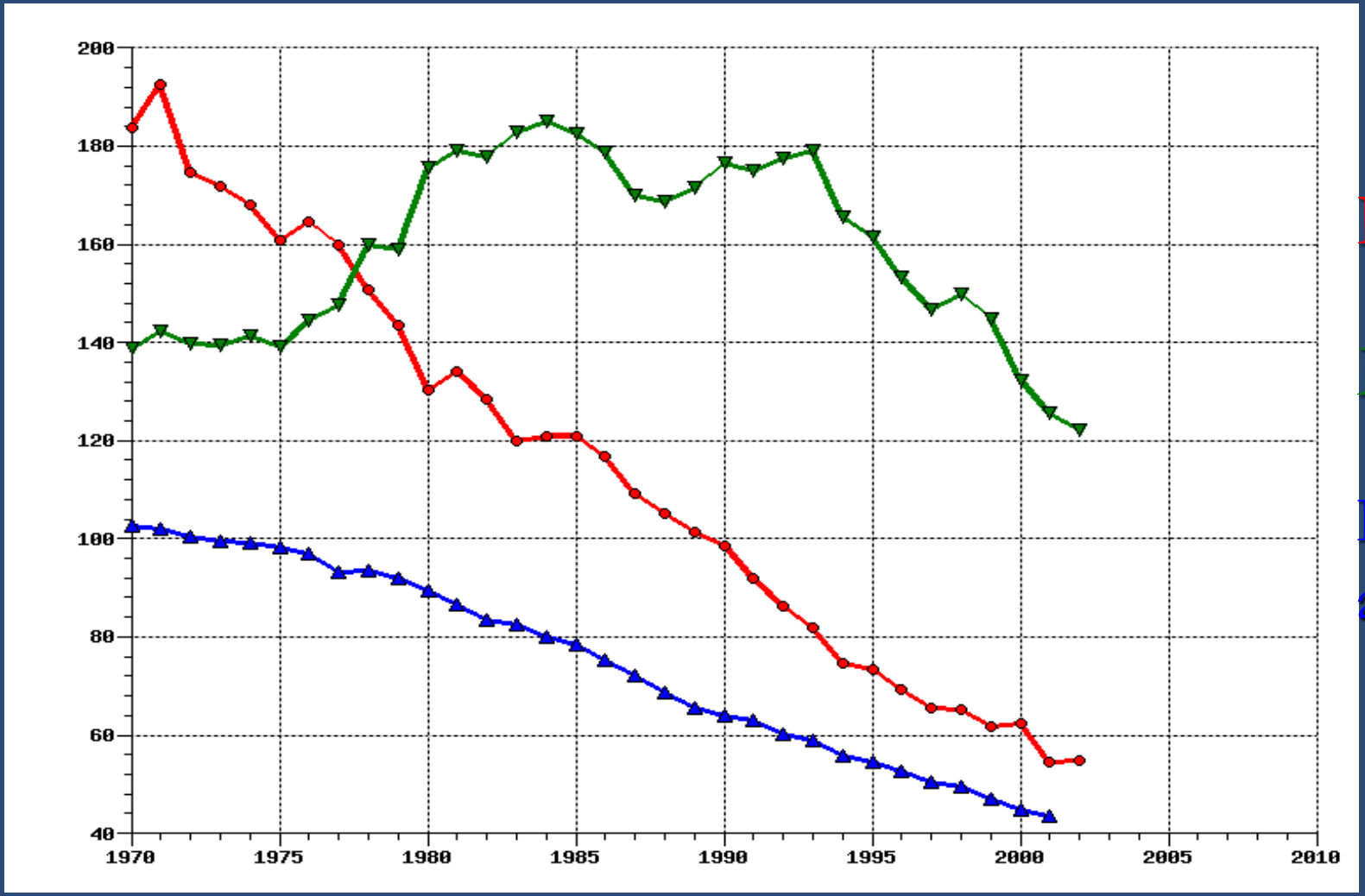
SDR, diseases of circulatory system in Western Europe, 0-64 yrs, per 1000000



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



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



- ✓ **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

RICH FOODS

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

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

- 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 oxigen 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, hypertention)

- **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)