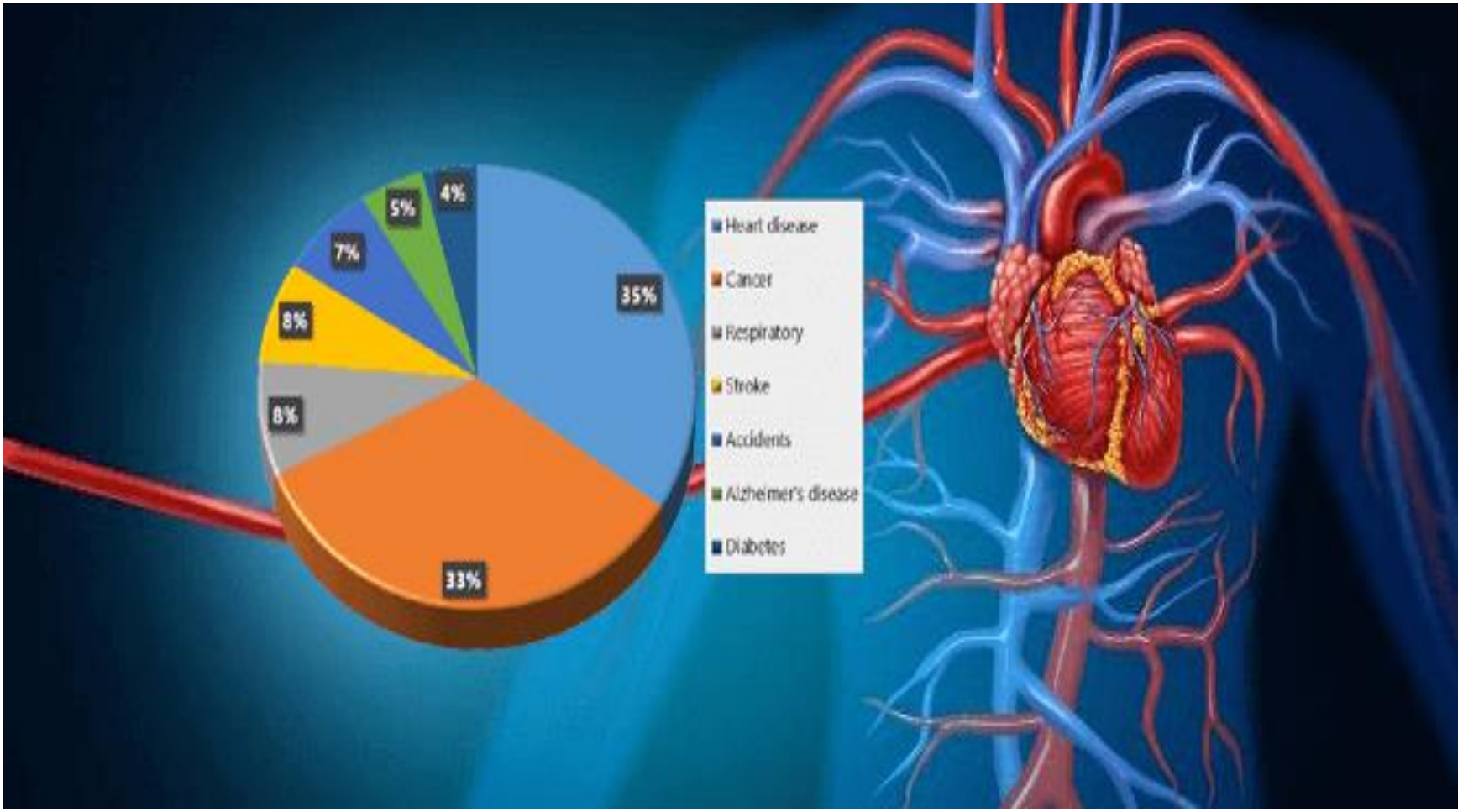
Epidemiology of IHD

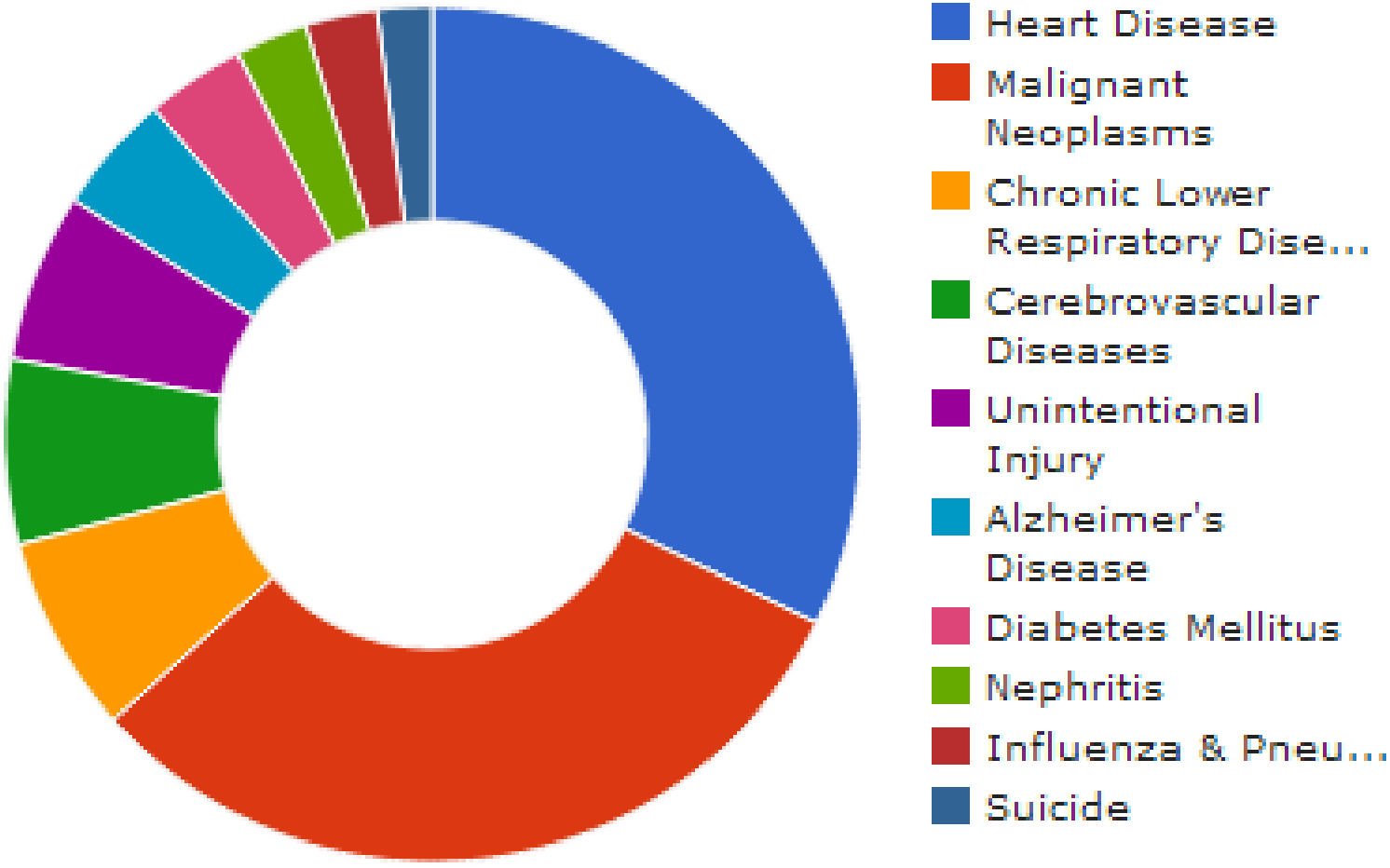
Ranjan Premaratna


35%
33%
8%
8%
7%
5%
4%
Heart disease
Cancer
Respiratory
Stroke
Accidents
Alzheimer's disease
Diabetes

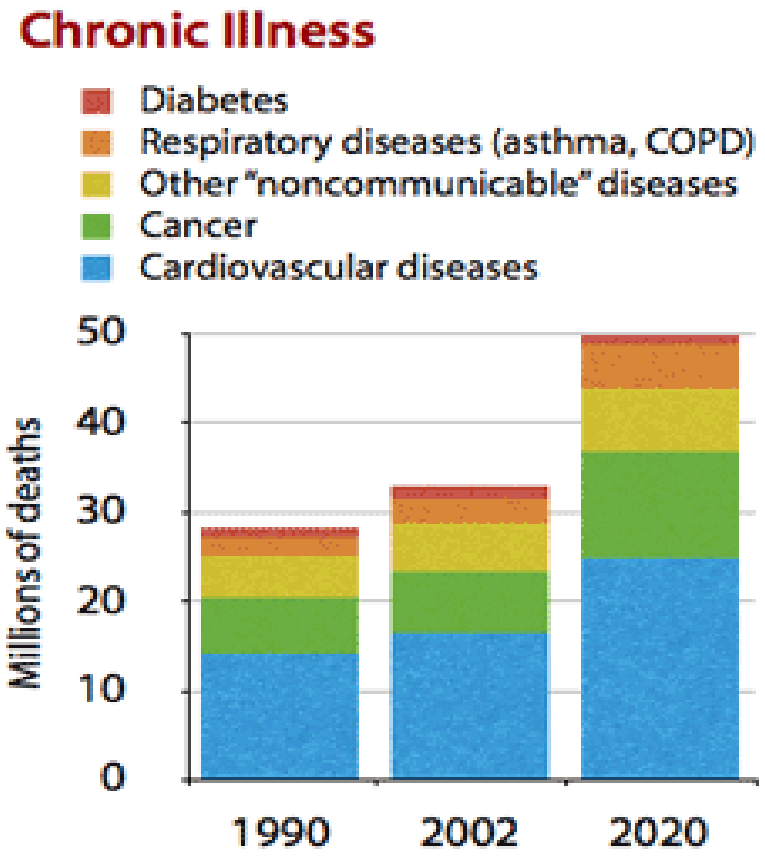
Cardiovascular disease

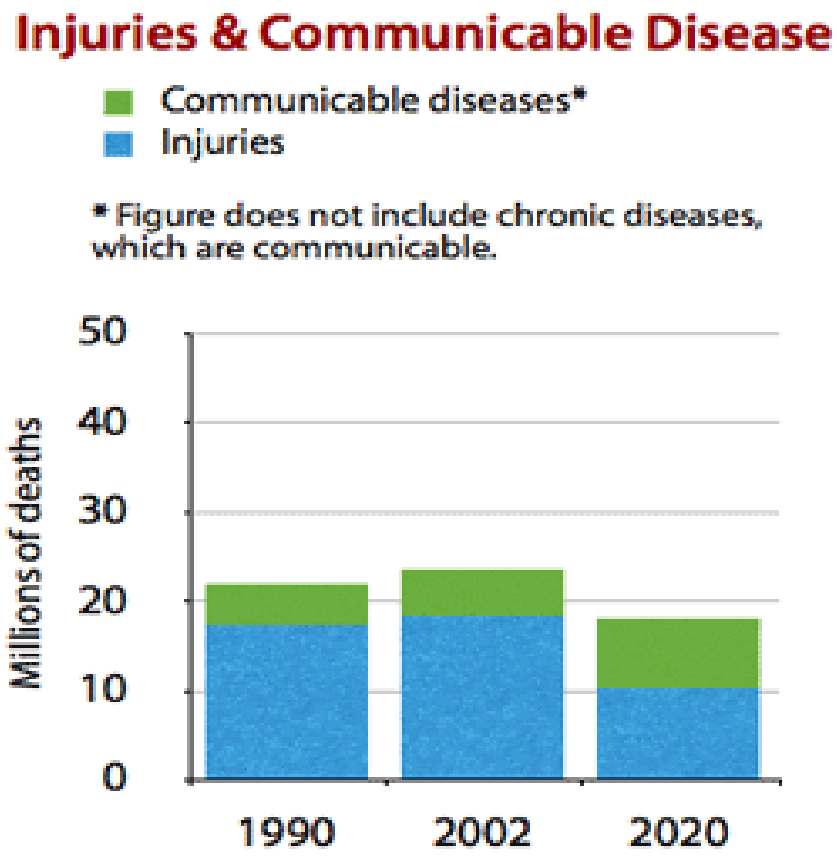
- Is the secret killer with many of the deaths occurring in the younger age group
- Sadly, a large number of these deaths happen suddenly having a great impact on family, friends & society at large.
- Many of these deaths especially in young are preventable

10 Leading Causes of Death, 2010



Annual Global Mortality by category





Source: Yach, D. et al. *JAMA* 2004;291:2616-2622.

Cardio-Vascular Diseases (CVD) Impact

- Cardiovascular death remains the biggest cause of death worldwide.
- An estimated 17.3 million people died from CVDs in 2008

- Estimated 7.3 million were due to coronary heart disease.
- 6 million due to stroke
- Over 80% of these deaths occur in low- and middle-income countries.

- 50% of the population in developed countries die of cardiovascular disease

- Someone has a heart attack every two minutes (British Heart Foundation)

- Leading cause of mortality in developed countries
- Rising tendency in developing countries (disease of civilization)
- A major impact on life expectancy

Morbidity-IHD

- Morbidity: nearly 30% of all disability cases
- Contributes to deterioration of the quality of life

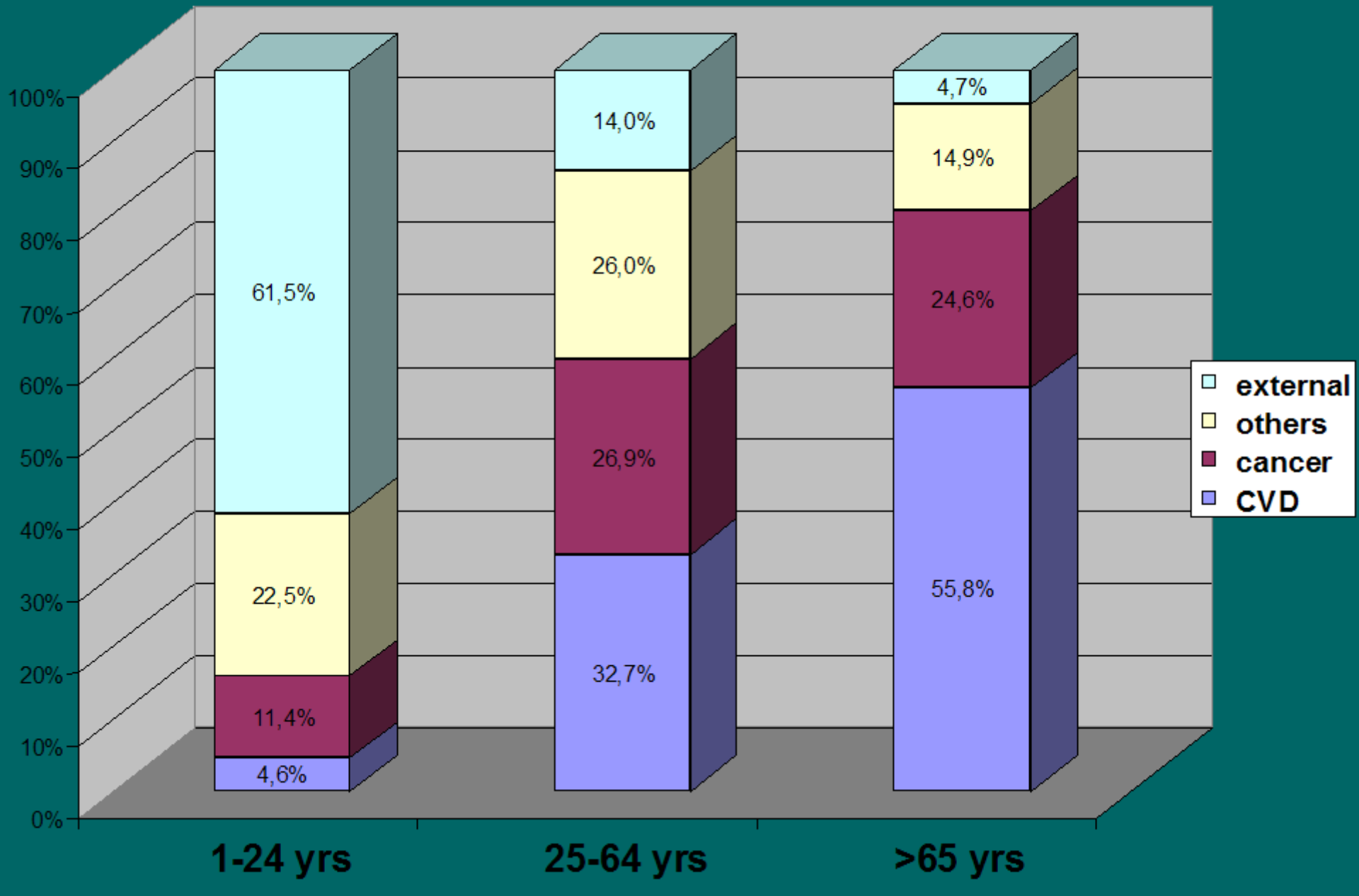
Atherosclerotic plaque vs Age

- Atherosclerotic plaques: start in childhood
- Around 20 years - adult lifestyle patterns (smoking, dietary habits, sporting behavior, etc.)

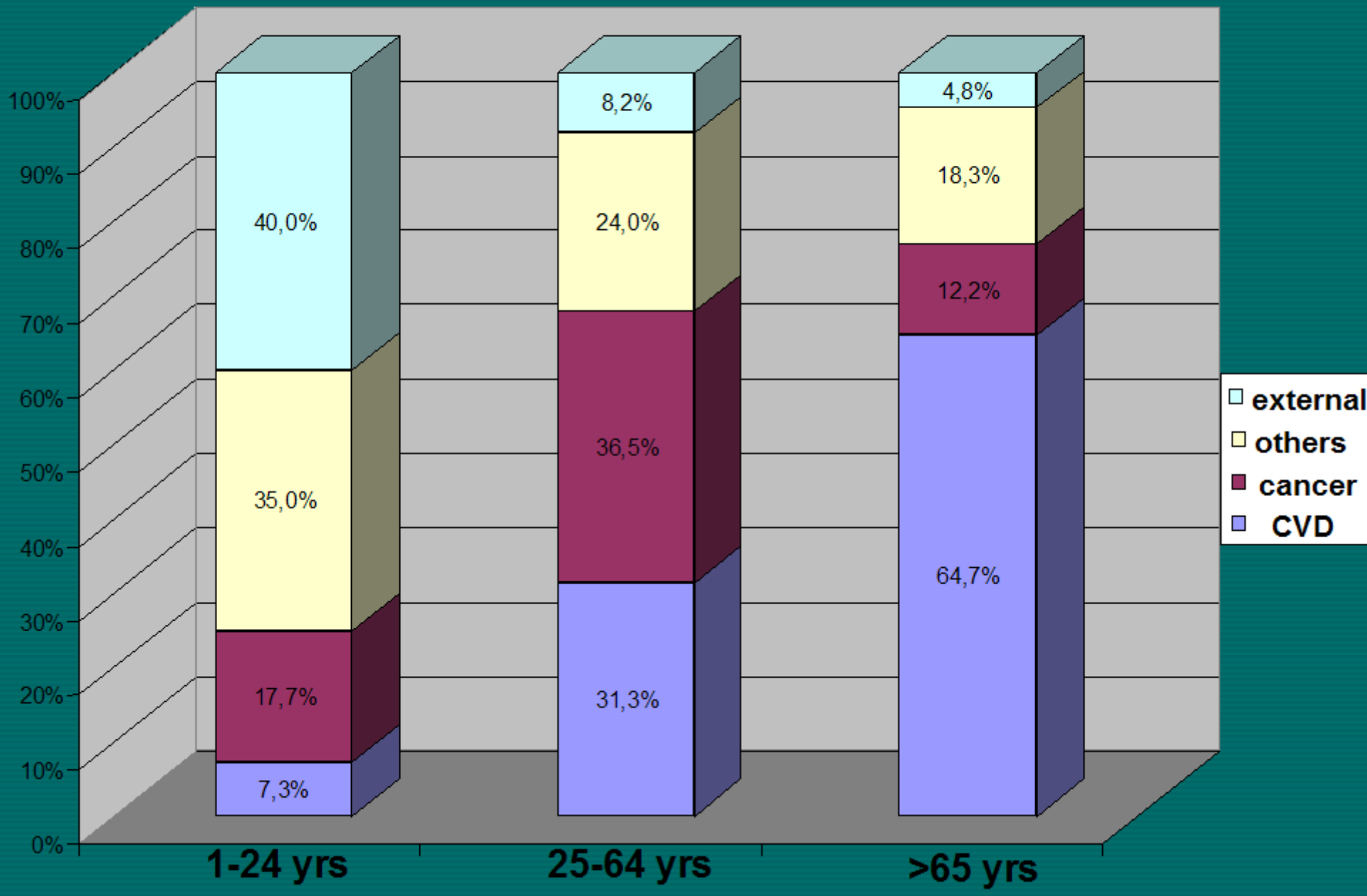
Age

- Increase in CVD morbidity and mortality: in age-group of 30-44 years
- Premature death (<64 years of age, or 25-64 years):
- In elderly population more difficult to interpret death rate due to multiple ill health causes

PROPORTION OF MORTALITY IN DIFFERENT AGE-GROUPS (MEN)



PROPORTION OF MORTALITY IN DIFFERENT AGE-GROUPS (WOMEN)



Sex

- CVD is often thought to be a disease of middle-aged men.
- Cardiovascular mortality (fatal cases) are more common among men.
- However, CVD affect nearly as many women as men, albeit at an older age

Women

- A Higher risk in women than men (smoking, high triglyceride levels)
- B Higher prevalence of certain risk factors in women (diabetes mellitus, depression)
- C Gender-specific risk factors (risks for women only) (oral contraceptives, hormone replacement therapy, polycystic ovary syndrome)

ETHNICITY

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

- Migration as the cause

World Trends: Developed countries

- Decreasing tendencies
  - (e.g, USA: 30% between 1988-98, Sweden: 42%)
- Improvement of lifestyle factors
  - (a decrease of smoking and a higher level of health consciousness)
- Better diagnostic and therapeutic procedures
  - (bypass surgeries, hypertension screening, pharmacological treatment of hypertension and hypercholesterinaemia, access to health care)

World Trends: Developing countries

- Increasing tendencies

  - increasing longevity, urbanization, and western type lifestyle

Role of Risk Factors

- Over 300 risk factors have been associated with coronary heart disease, hypertension and stroke

Classification of Risk Factors

Major modifiable risk factors - High blood pressure - Abnormal blood lipids - Tobacco use - Physical inactivity - Obesity - Unhealthy diet - Diabetes mellitus	***Other modifiable risk factors*** - Low socioeconomic status - Mental ill health (depression) - Psychosocial stress - Heavy alcohol use - Use of certain medication - Lipoprotein(a)
Non-modifiable risk factors - Age - Heredity or family history - Gender - Ethnicity or race	***"Novel" risk factors*** - Excess homocysteine in blood - Inflammatory markers (C-reactive protein) - Abnormal blood coagulation (elevated blood levels of fibrinogen)

Hypertension

Systolic blood pressure >120 mmHg and/or a Diastolic blood pressure > 80 mmHg

- Free of clinical symptoms for many years (screening)
- In most countries, up to 40 percent of adults suffering, increasing with age
- Positive family history
- Dietary habits (a high intake of salt, processed food, low levels of water hardness, high thyramine content of food, alcohol use)
- Modern lifestyle (increased sympathetic activity, psychosocial stress, leading position in job)

Lipids

- Se. cholesterol: structure and functioning of blood vessels, atherosclerotic plaques
  - Altering functions of cholesterol fractions (LDL: risk, HDL: protection)
  - Estrogen: tends to raise HDL-cholesterol and lower LDL-cholesterol, protection for women in reproductive age
- Partially genetic determination of metabolism, partially dependent of nutrition (egg, meats, dairy products)

Current Recommended Lipid Levels

	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)

Current Recommended Lipid Levels

Total Cholesterol Level	Category
Less than 200 mg/dL	Desirable
200-239 mg/dL	Borderline high
240 mg/dL and above	High

LDL Cholesterol Level	LDL Cholesterol Category
Less than 100 mg/dL	Optimal
100-129 mg/dL	Near optimal/above optimal
130-159 mg/dL	Borderline high
160-189 mg/dL	High
190 mg/dL and above	Very high

**Cholesterol levels are measured in milligrams (mg) of cholesterol per deciliter (dL) of blood.*

Tobacco Use

- The link between smoking and CVD (mainly IHD) 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

Smoking

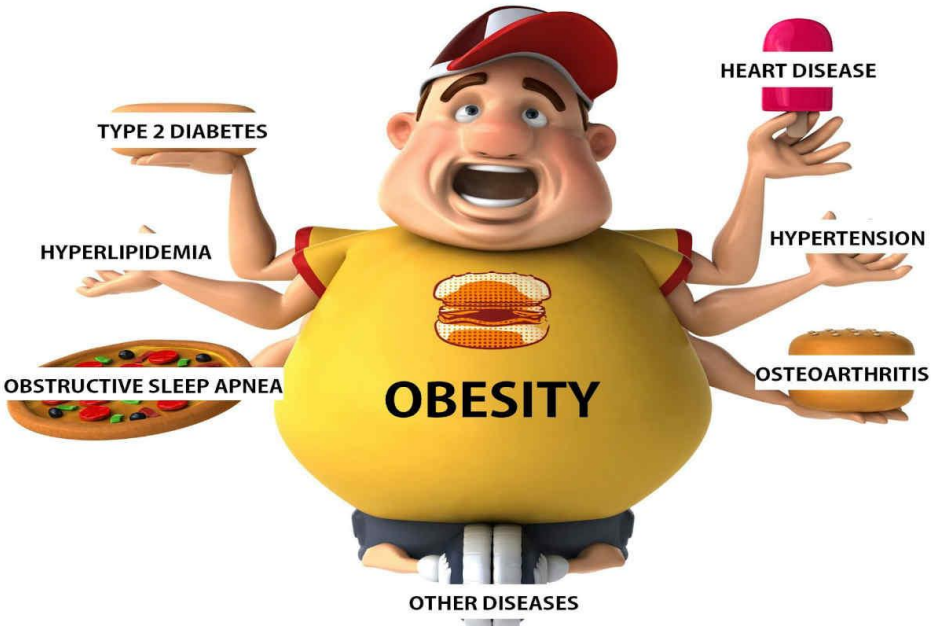
- Several mechanisms:
  - damages the endothelium lining, increases atherosclerotic plaques, raises LDL and lowers HDL, promotes artery spasms, raises oxygen demand of the heart muscle

- Nicotine accelerates the heart rate (RR), and raises blood pressure

Physical Inactivity

- Modernization, urbanization, mechanized transport: sedentary lifestyle (60% of global population)
  - Raises CVD risk and also the development of other risk factors
  - (glucose metabolism, diabetes mellitus, blood coagulation, obesity, high blood pressure, worsening lipid profile)

Obesity



- BMI > 25: overweight
- BMI > 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

- Diabetes mellitus: damages both peripheral and coronary blood vessels

- Unhealthy diet: low fruit and vegetable, fiber content, and high saturated fat intake, refined sugar

Unhealthy Diet

- Low fruit and vegetable, fibre content, and high saturated fat intake, refined sugar

Psychological factors

- Psychological factors
  - (Type A behavior, hostility)

- Depression and CVD: bidirectional link
  - a., depression may increase the risk of CVD and worsen recovery process
  - b., CVD may induce depression

Social factors

- Low socioeconomic status (SES)
  - a., in developed countries: less educated and lower SES groups (accumulation of risk factors)
  - b., in developing countries: more educated and higher SES groups (western lifestyle)

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)

Prevention-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)

Prevention-Secondary

- Screening and treatment of symptomatic patients
- Set up personal risk profile

Prevention-Tertiary

- Cardiovascular rehabilitation

- prevention of recurrence of CVD (new heart attack: 5-7 times higher risk among CVD patients)

Approaches

- The individual approach (detecting those at greatest risk): lifestyle guidelines (e.g., smoking cessation)
- The population-wide approach: (the whole population, western lifestyle)

- Example for community-wide CV prevention programs:
  - Framingham Heart Study (1948-) Framingham Risk Scoring
  - North-Karelia Project (1972-) Finland
  - Stanford Projects (1972-75, 1980-86) USA
  - Minnesota Cardiovascular Health Program (1980-88) USA
  - Multiple Risk factor Intervention Trial (1972-79) USA