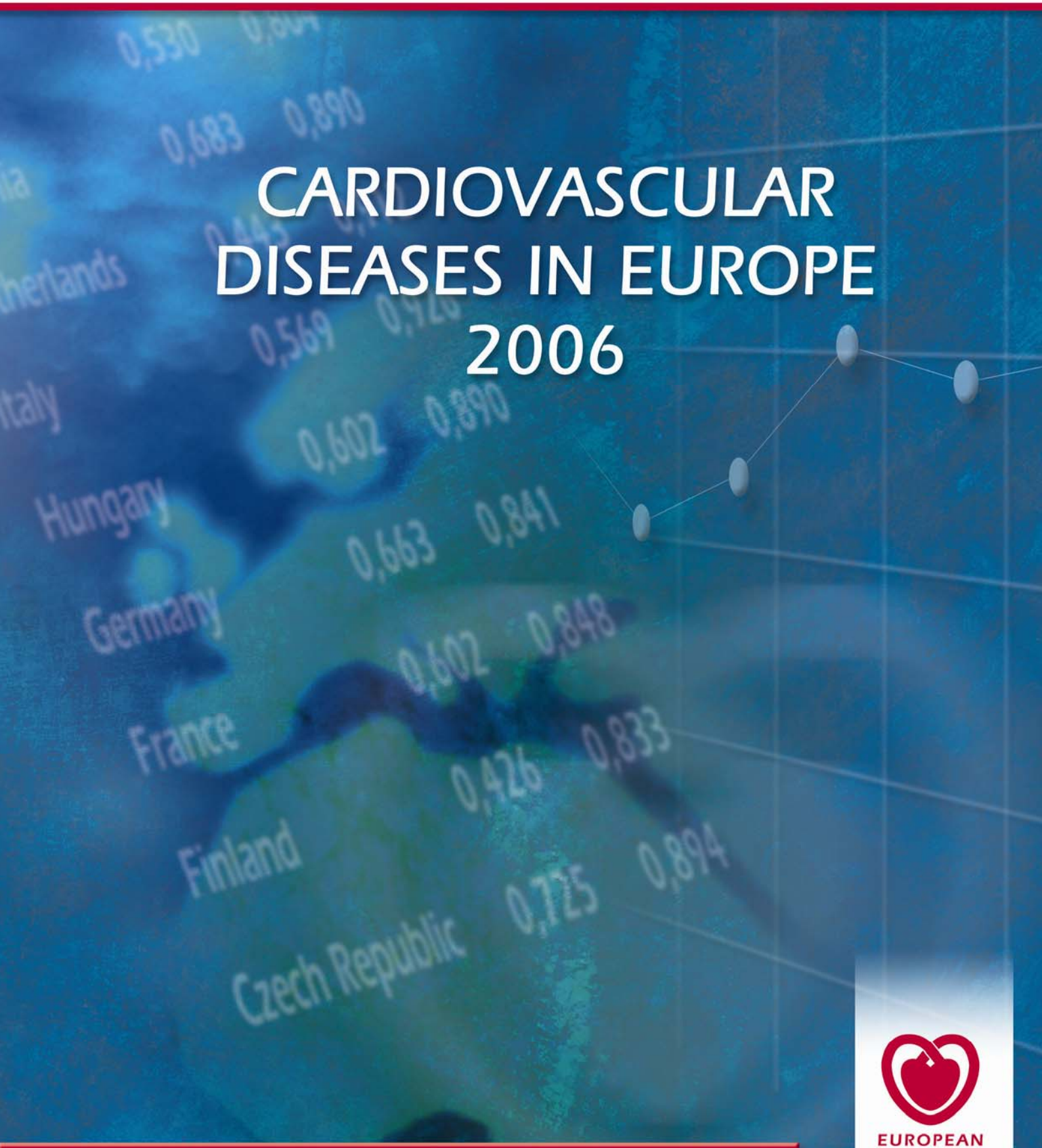
EURO HEART SURVEY

CARDIOVASCULAR DISEASES IN EUROPE 2006



Dedicated to reduce the burden of cardiovascular disease in Europe

EUROPEAN SOCIETY OF CARDIOLOGY®

Cardiovascular Diseases in Europe

Euro Heart Survey

2006

Edited by
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Sophia Antipolis, France 2006

Preface

Cardiovascular diseases remain the major cause of death across Europe, and a major cause of morbidity and loss of quality of life. Every year more than 4 million Europeans die from diseases of the heart and blood vessels. New methods for prevention and treatment of cardiovascular diseases have delayed the onset of clinical manifestations, have improved the immediate disease outcome, and have improved life expectancy. This has resulted in an increasing number of patients who survive a cardiovascular event, and who require subsequent medical or interventional therapy. The burden of cardiovascular disease has shifted from the middle-aged to the elderly, and remains high.

The prevalence of many cardiovascular diseases increases exponentially with ageing, especially coronary heart disease, heart failure, atrial fibrillation, hypertension and aortic stenosis. This is a challenge for modern cardiology since all surveys show that management of elderly patients often differs from management in younger patients. Specific attention is needed for guideline development and adherence with respect to elderly patients.

The European Society of Cardiology (ESC) brings together more than 45,000 cardiologists, scientists and other professionals in cardiovascular disease management from 49 countries in Europe. Important differences exist between these countries with respect to the structure of the population, socio-economic development and health care system. In order to achieve its mission: *"to reduce the burden of cardiovascular disease in Europe"*, the ESC needs to understand differences in prevalence of cardiovascular diseases throughout the member countries, as well as differences in the availability and use of cardiovascular diagnostic and therapeutic procedures.

Quality assurance in medicine is a continuous process and involves many different components. The ESC will continue to promote research, guideline development, education and a critical review of the practice of cardiology and cardiovascular medicine through surveys and registries. This report is an illustration of this ongoing process.

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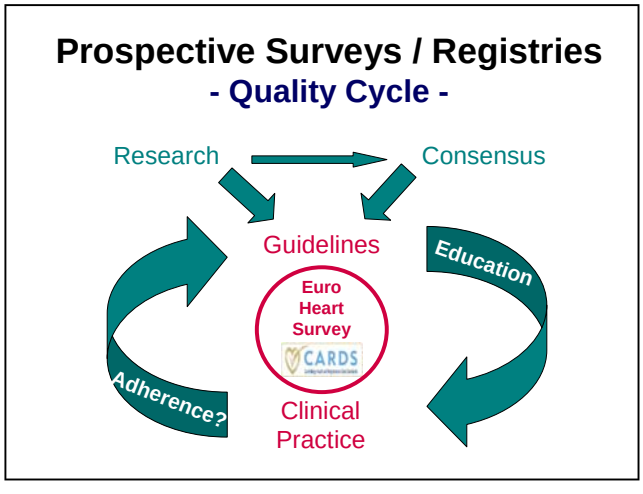
Introduction

Cardiovascular disease is the major cause of death and disability in the Western world. The European Society of Cardiology (ESC) is dedicated to improve health in Europe by reducing the impact of cardiovascular diseases. For priority setting and initiating future activities, quantitative information on the burden of cardiovascular diseases, and on the availability and application of diagnostic and therapeutic tools is indispensable.

To reduce the burden of cardiovascular diseases in Europe, the ESC takes responsibility for education and training of cardiologists and other health care professionals, and for the development of standards for training, continuing education, and professional conduct. Guidelines for prevention, diagnosis and treatment of cardiovascular diseases are part of education programmes and assist clinicians in patient management. The Euro Heart Survey Programme monitors to which extent clinical practice corresponds to existing guidelines. These efforts can be summarised as a cycle of quality improvement in order to reduce the burden of cardiovascular disease in Europe.



This fourth ESC Report on Cardiovascular Diseases in Europe consists of two parts. Part I describes the European population, and part II presents some highlights of the Euro Heart Survey Programme. In both parts of the report, special attention is given to ageing and the elderly.

In the first part of this report an overview is presented of the ageing of the European population, the life expectancy across European countries, and indicators of the burden of cardiovascular disease, such as cardiovascular risk factors, cardiovascular mortality, hospital discharge diagnosis of cardiovascular diseases, and health care resources. Data is extracted from the *World Health Organisation (WHO) European Health for All database*, the *WHO Mortality database*, *Eurostat databases*, and the *United States Consensus Bureau International database*. Cardiovascular mortality, indicators of cardiovascular morbidity and management of cardiovascular patients are shown in time trends from 1970 or 1980 to 2004. The current situation is shown in maps that present the latest available data per country, which in most cases is 2004 data. Trends are presented for groups of countries that are often used as benchmarks in the different parts of the European Region. The following groups of countries are presented:

- European Region: the 52 countries of the WHO Region.
- EU: the 25 Member States of the European Union.
- EU-15: the 15 Member States of the European Union prior to 1 May 2004.
- EU-10: the 10 Member States which joined the European Union from 1 May 2004.
- CIS: the 12 countries of the Common-

wealth of Independent States, which are 12 out of 15 countries of the former USSR.

In view of the large heterogeneity in age across countries, standardisation is needed for comparisons of health indicators between countries. The Appendices present an account of the applied standardisation procedures, the European Standard Population used as the reference population, a list of definitions of indicators of burden of cardiovascular disease, a list of abbreviations used, and a tabular overview of the data presented in the graphs of this report per country.

Main findings of the first part of this report are:

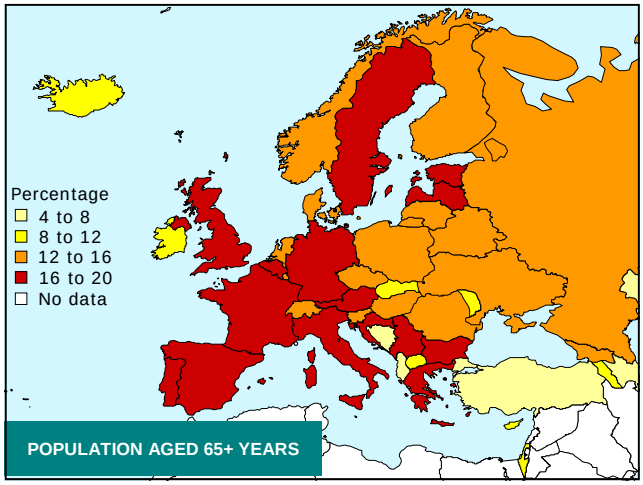
- With the ageing of the European population, the prevalence of diseases of the elderly, including cardiovascular diseases, is increasing.
- There is still a significant variation in the burden of cardiovascular diseases across the ESC member countries, with relatively low mortality in Southern and Western Europe, and relatively high mortality in Eastern Europe.
- The total burden of cardiovascular disease remains large, and is shifting to the elderly population.

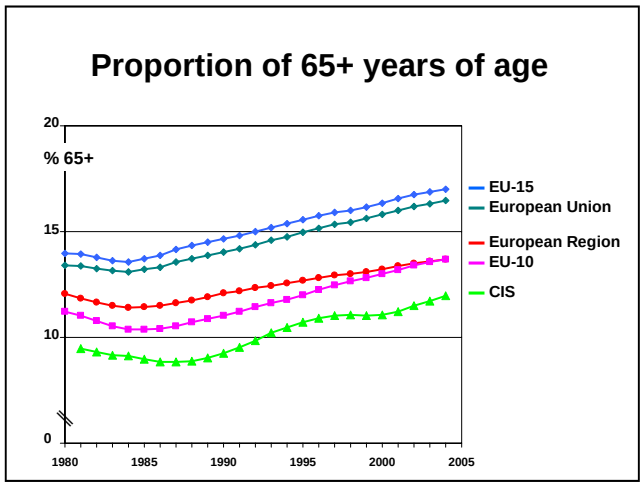
The second part of this report presents a brief summary with some highlights of the Euro Heart Survey Programme. Detailed analyses of available data are provided in publications of these surveys in the European Heart Journal and elsewhere. The Appendix of this report contains a list of all publications from the Euro Heart Survey Programme. Additional analyses were performed to evaluate the impact of age on patient management.

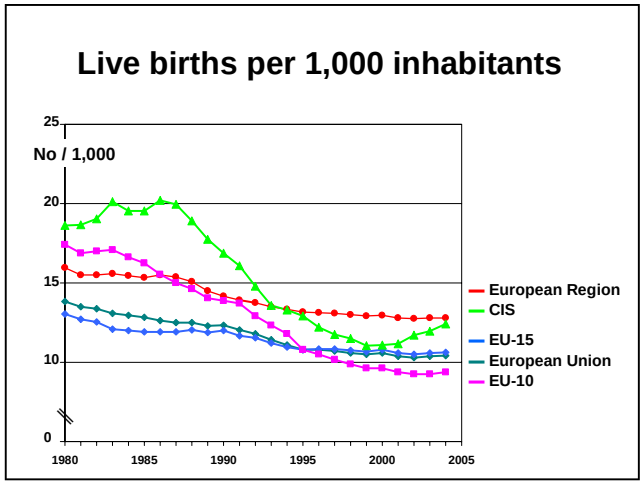
Main findings of the second part of this report are:

- Clinical practice varies significantly among hospitals and countries across Europe, both with regard to patient characteristics, the application of diagnostic and therapeutic measures, and preventive medicine.
- The adherence to guidelines for prevention and management of cardiovascular disease did improve when compared with earlier surveys, and was associated with improved patient outcome. Yet, in many hospitals these guidelines have only partly been implemented and the adherence to guidelines should be further improved.
- Elderly less often undergo diagnostic procedures and less often receive medication to prevent a (recurrent) cardiovascular event. In patients who had a coronary angiogram, Percutaneous Coronary Interventions and/or surgery are, however, as often applied in elderly as in middle-aged patients.

Ageing







The population in Europe is ageing rapidly. At present (latest available data ≈ 2004), 13.7% of the European population is aged 65 years or older which is twice the world level. There is an apparent west-east gradient with more elderly people in the Western countries. This reflects the longer life-expectancy in Western countries, which is partly a result of the lower age-specific mortality from cardiovascular diseases.

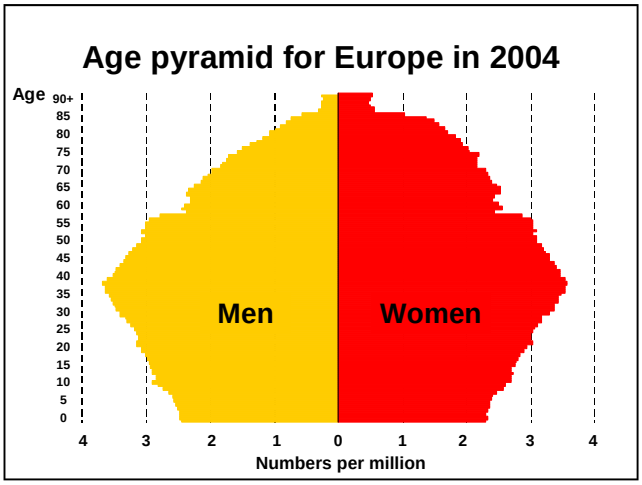
In most countries the median age is well over 30 years, the highest being 41.6 years in Italy. High proportions of elderly are present in Italy (18.9%), Germany (18.3%), Greece (18.0%), and Sweden (17.2%). Relatively young populations are observed in Bosnia and Herzegovina (6.3%), Turkey (4.2%), and all the countries of the Central Asian Republics (CARK) (on average 5.3%).

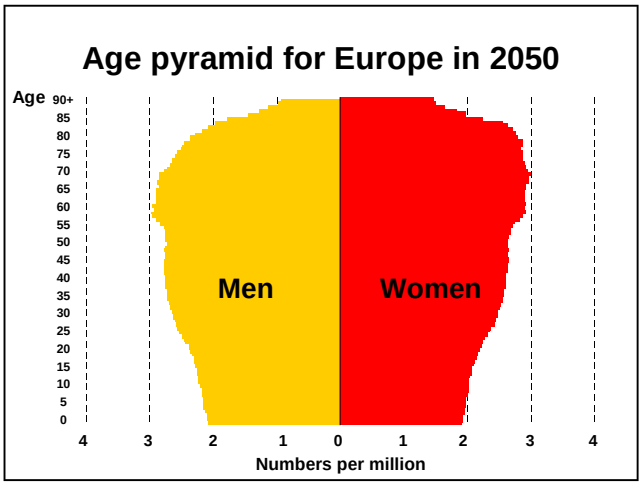
Since 1980, the percentage of the population 65 or older increased from 12.1% to 13.7% in the European region. This ageing process is present in most European countries. In the EU-15 countries (EU members before May 2004), the percentage of 65+ increased from 14.0% to 17.0%, while in the Commonwealth of Independent States (CIS) an increase is observed from 9.5% to 12.0%. The largest increase in age is observed in Italy, while the proportion of 65+ remains stable or is decreasing in Ireland, Israel, Spain, Serbia and Montenegro, San Marino, Luxembourg, United Kingdom, and Turkey. At the same time, countries with high proportions of elderly people often have a low birth rate including Germany (8.6%), Bulgaria (9.0%), Italy (9.4%), and Greece (9.6%), whereas a high birth rate is ob-

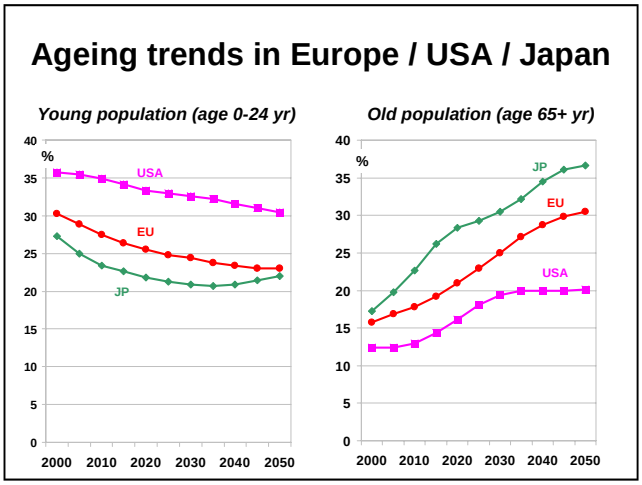
served in populations with a young age structure such as Turkey (20.9%) and Albania (15.2%). These figures indicate that current differences in age structure between countries are likely to remain. As the European Region is larger than the sum of the presented sub regions, i.e. also includes the CARK region with high birth rates (currently 20.8%), its trend of live births can be higher than that of the sub regions.

As the post World War II 'baby boom' generation, the largest generation, climbs up the age pyramid, we see more elderly and fewer younger people. The current percentage of aged 65 or older is expected to double to about 30% in 2050. In the USA, the proportion of those aged 65 or older is expected to stabilise around 20% after 2035. In about the same year, for Japan, the proportion of the younger people, age 0-24, is expected to increase. For Europe a steep increase in the proportion of elderly is observed, while the proportion of the younger generation is expected to drop further. This means that there will be fewer younger people to drive the economy and pick up the growing welfare, social, and health care bills.

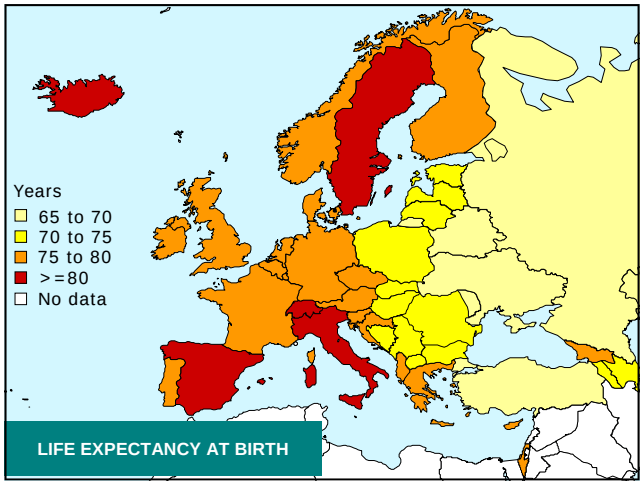
For every 100 persons aged 25-64 in 2050, we can expect 57 persons aged 65 years or older. This so-called Old Age Dependency Ratio (OADR) will be twice as high in 2050 as its current value of 28 per 100. The increase in ageing will further increase the burden of cardiovascular disease in Europe. Despite positive developments in prevention and treatment, diseases of the elderly, including cardiovascular diseases, and related health care costs will continue to increase.

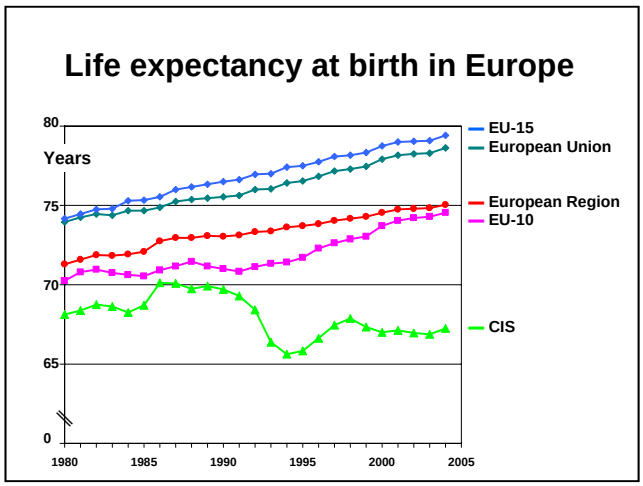


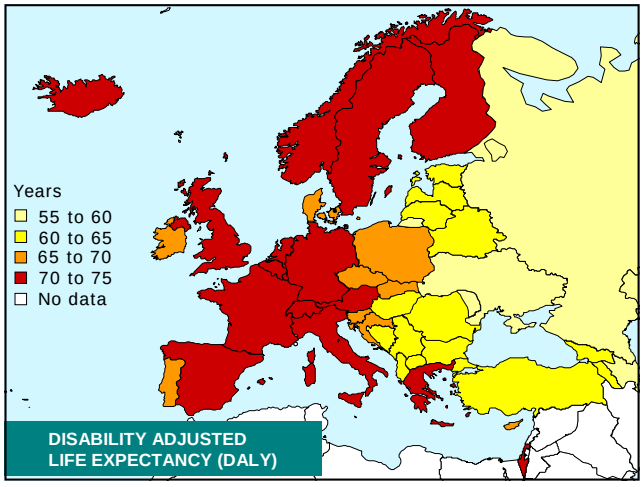




Life Expectancy







At present, the average life expectancy at birth of the European population is 75.1 years, and 78.6 years for the 25 Members States of the European Union. Relatively high life expectancies at birth are present in Iceland (81.2 years), Switzerland (80.8 years), Spain (80.4 years), Sweden (80.1 years), and Italy (80.1 years). Relatively low life expectancies are observed in the Russian Federation (65.4 years), Kazakhstan (66.2 years), Ukraine (67.7 years), Republic of Moldova (68.6 years), and Turkey (68.7 years). It should be noted that the estimated life expectancy of some countries most likely is overly optimistic because of an under-registration of death cases. Particularly high levels of mortality under-registration are observed in countries which were affected by armed conflicts during 1990's, e.g. Georgia, Albania, and several countries of the CIS region and former Yugoslavia.

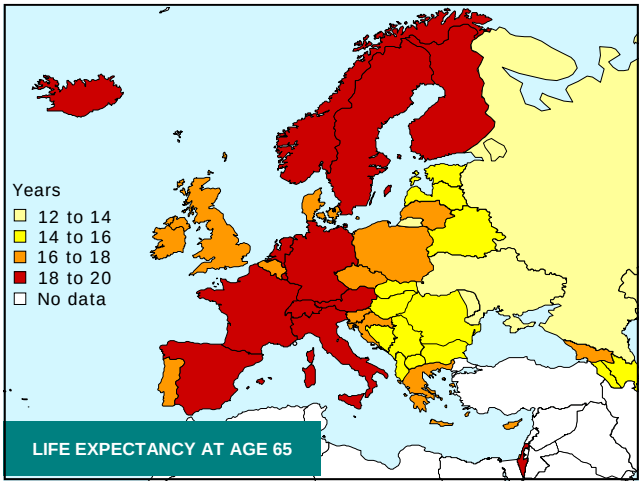
Since 1980, the life expectancy at birth of the European population increased from 71.3 to 75.1 years, with similar trends for men and women. The last decades of the 20th century were marked by an increasing gap in life expectancy between people living in the eastern and western parts of the European Region. All western European countries have enjoyed a continuous increase in life expectancy. In the EU-15 countries, the average gain since 1980 is 5.3 years at birth. In contrast, in the CIS region the average life expectancy decreased from 68.1 to 67.2 years. In-depth mortality studies presented in the European Health Report demonstrated that an unhealthy lifestyle in these countries played a significant role. Analysis of changes in mortality in the CIS region by cause and

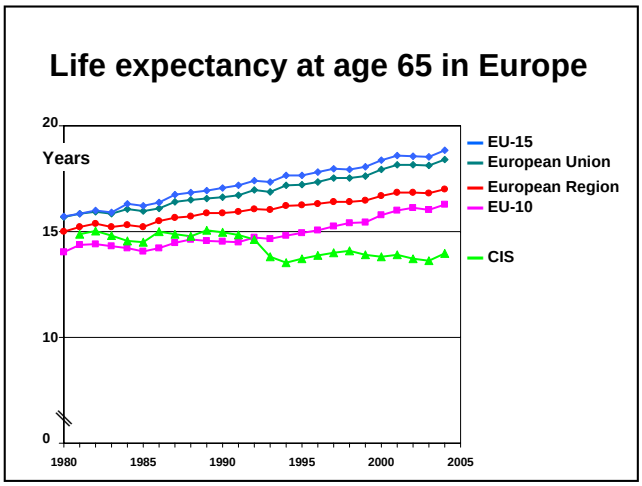
age during the decline in life expectancy up to 1994, and the subsequent improvement in 1995–1997, has shown that these changes were mainly due to changes in external causes of death and increased occurrence of cardiovascular diseases among middle-aged adults. A marked west-east gradient is also observed for the disability adjusted life expectancy (DALY), with a high DALY for Sweden (73.3) and Switzerland (73.2), and a relatively low DALY in Turkmenistan (54.4).

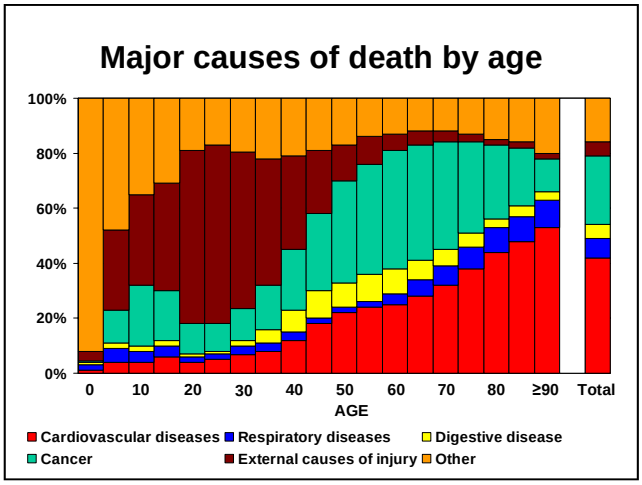
With age, the relative difference in life expectancy between the eastern and western part of Europe gradually diminishes. In most countries the life expectancy at age 65 is over 15 years, with the highest being 19.8 years in Switzerland and the lowest being 13.1 years in the Republic of Moldova. Relatively high life expectancies at age 65 are also present in Spain (19.7 years), Iceland (19.6 years), France (19.6 years), and Italy (19.2 years). Relatively low life expectancies at age 65 are further observed in Kazakhstan (13.4 years), Russian Federation (13.7 years), and Ukraine (13.9 years).

Since 1980, the life expectancy at age 65 of the European population increased from 15.0 to 17.0 years. In the EU-15 countries the average gain at age 65 since 1980 is 3.1 years, while in the CIS the average life expectancy at age 65 decreased from 14.9 to 14.0 years over time.

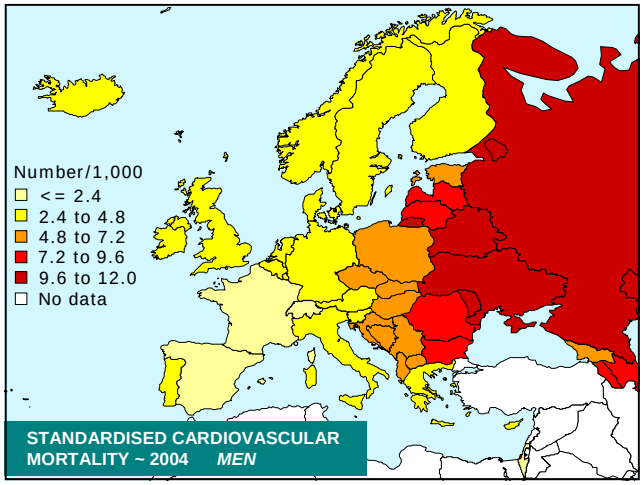
With age, the prevalence of death due to cardiovascular diseases increases steeply. In total, about 40% of deaths are caused by cardiovascular diseases, with a prevalence of up to 50% in the elderly.

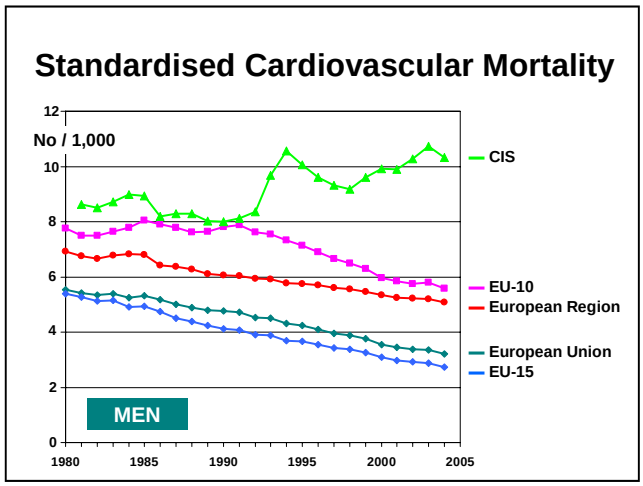


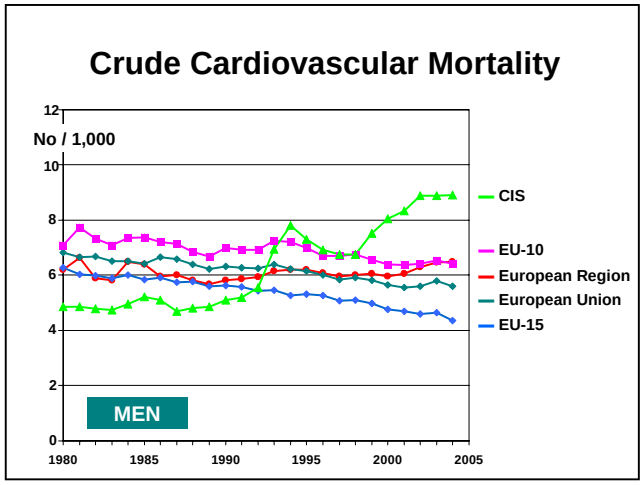




Cardiovascular Mortality







Cardiovascular disease is the main cause of death in most countries in Europe. At present (latest available data ≈ 2004), the average age standardised cardiovascular mortality ratio is 5.1 per 1,000 inhabitants for men, and 3.4 for women. For the 25 Members States of the European Union these figures are 3.2 and 2.1. On average, cardiovascular diseases are responsible for almost half of the total mortality. However, the ratios of cardiovascular to total mortality rates standardised for age, vary from about 35% in some western countries to about 60% in some eastern European countries.

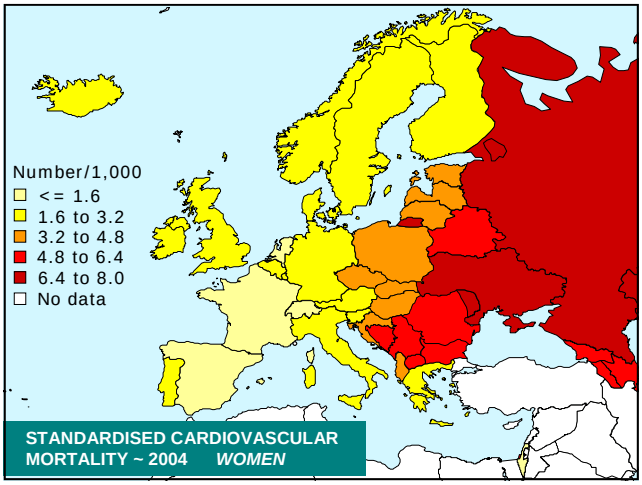
There is a marked west-east gradient in the age standardised cardiovascular mortality rates. The cardiovascular mortality rates for women are lower than those for men in all European countries, with the largest female-male difference in the CIS region. The distribution of cardiovascular mortality and the presence of the west-east gradient, however, is similar for men and women. The highest cardiovascular mortality figures, for both men and women, are observed in Kazakhstan (8.7 per 1,000 inhabitants; men 10.7; females 6.7), Russian Federation (8.3/1,000; men 11.3; women 6.4), Ukraine (8.1/1,000; men 10.6; women 6.5), and Republic of Moldova (8.1/1,000; men 9.7; women 7.0). Relatively low cardiovascular mortality numbers are present in France (1.6/1,000; men 2.1; women 1.2), Israel (1.7/1,000; men 2.1; women 1.5), Spain (1.9/1,000; men 2.1; women 1.4), and Switzerland (1.9/1,000; men 2.4; women 1.5).

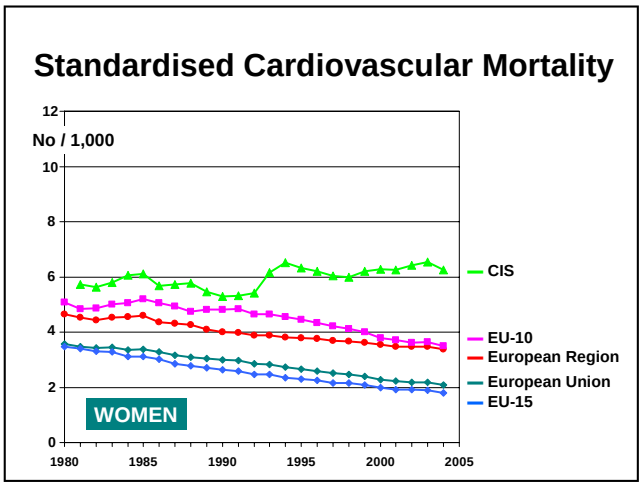
Trends of age standardised cardiovascular mortality during the 1980-2004 period show

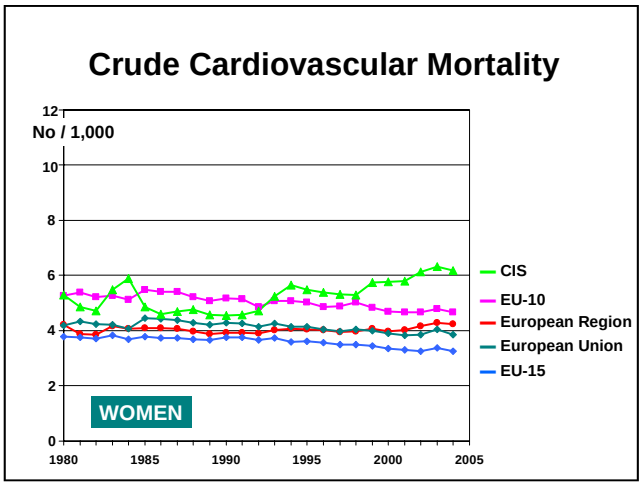
Cardiovascular Mortality

a similar pattern to all cause mortality: down sloping curves in the Nordic, Western and Southern region (except Greece), but stable, or up sloping curves in Central and Eastern Europe. In the European Region cardiovascular mortality decreased from 5.5 to 4.3 per 1,000 inhabitants. In the European Union, a steeper cardiovascular mortality decline is observed since 1980: from 4.4 to 2.6 per 1,000 inhabitants. In the EU-15 countries, the average decline per 1,000 inhabitants since 1980 is even steeper: from 4.3 to 2.3. On the contrary, in the CIS, with already the highest cardiovascular mortality rate in 1980 (6.7 per 1,000 inhabitants), the average cardiovascular mortality rate increased to 8.0 per 1,000 inhabitants. These figures demonstrate a strong and continuing increase in the west-east gradient.

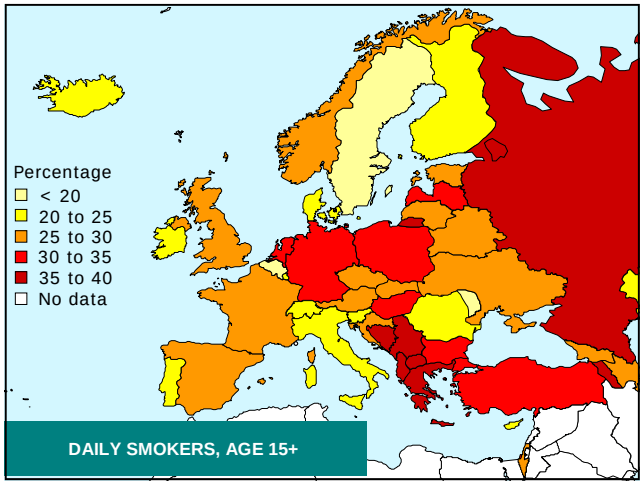
The crude mortality rates vary less between countries than the age standardised mortality rates, reflecting the much lower mean age of the population in the CIS region. It is important to note that while age standardised cardiovascular mortality rates continue to decline in most European countries, the crude, non-standardised mortality rates remain approximately stable in most western countries and even increase in most eastern European countries. Hence, the total burden of cardiovascular disease remains high, due to the ageing of the population. Better prevention and management will reduce early mortality and morbidity, and will improve life expectancy and quality of life. However, this will not dissolve the burden of cardiovascular disease.

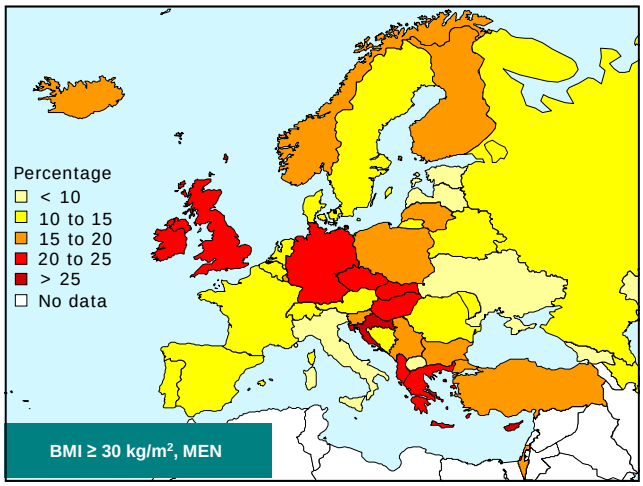


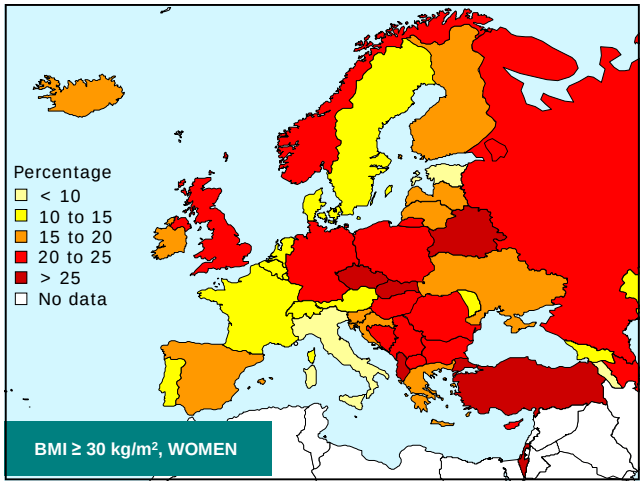




Cardiovascular Risk Factors







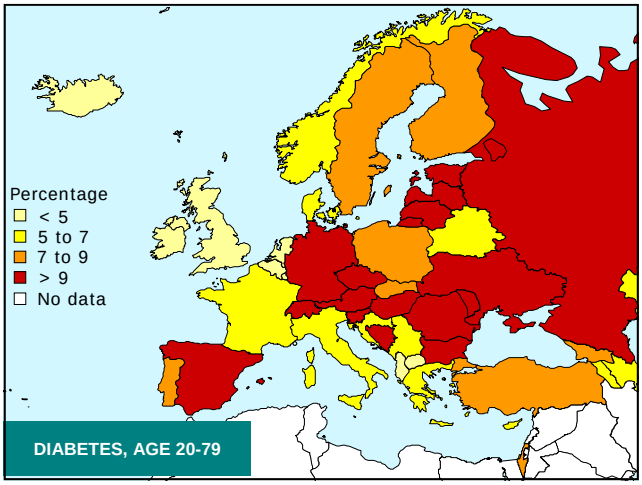
The prevalence of smoking varies across European countries, with relatively low figures in the Republic of Moldova (15%), and Sweden (16%), and relatively high numbers in Albania (39%), Greece (37%), and Bosnia and Herzegovina (37%). In all countries, men smoke more often than women, except for Sweden (18% of women versus 15% of men). The prevalence of smoking in men is generally higher in Central, and Eastern European countries, while for women the prevalence of smoking is generally higher in Northern, and Western countries. The prevalence of smoking decreases in most European countries, with a decline from 30.2% in 2000 to 29.4% in 2004 for the European Region.

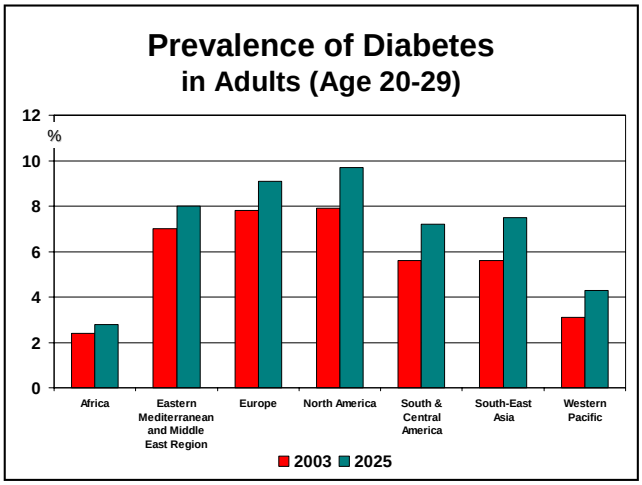
In most countries, obesity (body mass index (BMI) ≥ 30) is more prevalent in women than men. Relatively high prevalence rates for men were found in Croatia (31%) and Cyprus (27%), and for women in Albania (36%), Belarus (32%), and Turkey (29%). The International Obesity Task Force estimated that overweight (BMI ≥ 25) affects about half of the adult population in the European Region. The average BMI for the European Region is nearly 26.5. Obesity affects up to a third of the adult population in the European Region. It is estimated that almost 400 million adults in Europe are overweight and about 130 million are obese. If the prevalence continues to increase at the same rate as in the 1990s, it is estimated that about 150 million adults (26% of population) in the European Region will be obese by 2010. Even in countries with traditionally low rates of overweight and obesity such as France, the Netherlands, Denmark, and Nor-

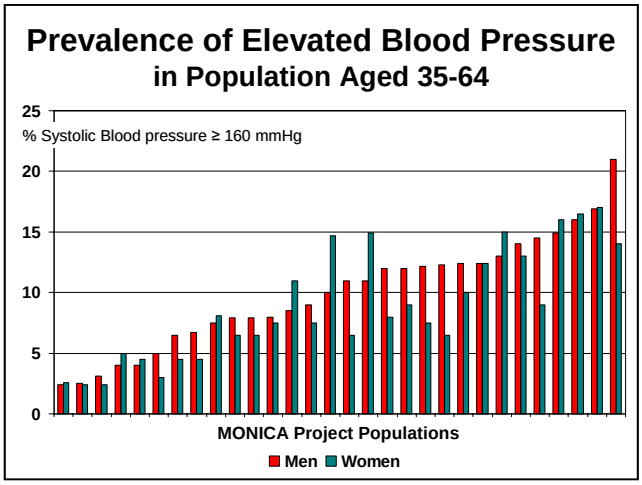
way, an increase of overweight is observed. Also the prevalence of childhood obesity increases steeply. Currently, about 20% of children in Europe are overweight, and of these a third are obese.

The International Diabetes Federation estimated that about 194 million people worldwide, or 5.1% of the adult population (20-79 years), have diabetes and that this number will increase to 333 million (6.3%), by 2025. The European Region currently has a relatively high number of 48 million people suffering from diabetes. Within Europe a relatively high prevalence of diabetes is observed in Germany (10.2%), Bulgaria (10.0%), and Spain (9.9%), while a relatively low prevalence of diabetes is found in Iceland (2.0%), Ireland (3.4%), and the Netherlands (3.7%). Based on the ageing of the European population, the 2003 prevalence rate of 7.8% in the European Region is expected to increase to 9.1% in 2025.

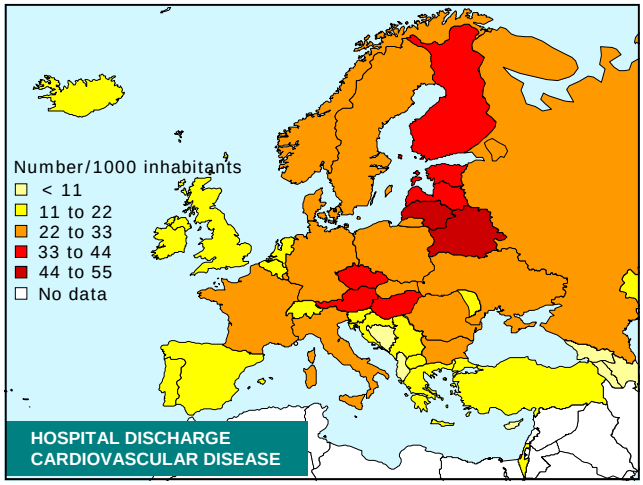
The WHO MONICA project took place from mid-1980s to mid-1990s. Across 38 populations in 21 countries in men and women aged 35-64, it was observed that systolic and diastolic blood pressure varies between populations. A relatively low prevalence of elevated systolic blood pressure (< 4%) was observed in regions of France, Spain, and Belgium, while a relatively high prevalence (> 15%) was found in regions of Germany and Finland. Pooling the 38 populations showed that both systolic and diastolic blood pressure fell over time (-2.2 mmHg in men, -3.3 mmHg in women; -1.4 mmHg in men, -2.2 mmHg in women, for systolic and diastolic blood pressure respectively).

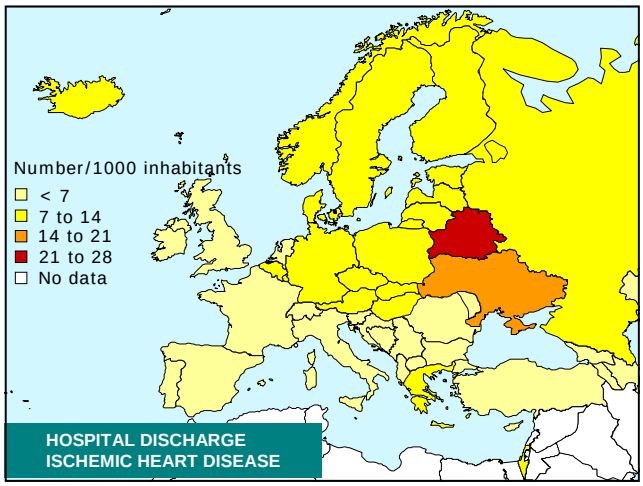


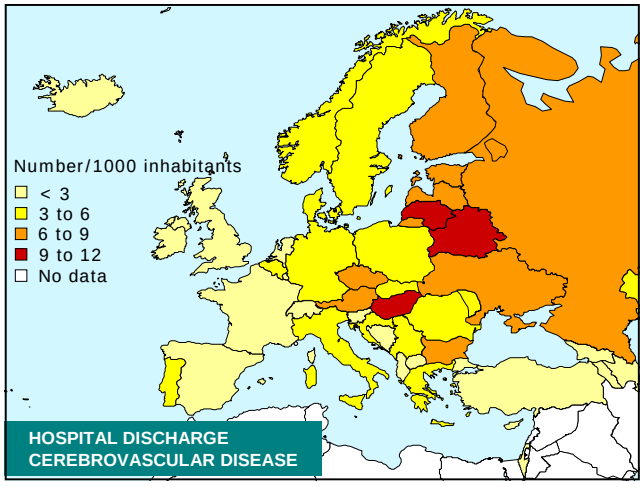




Hospital Discharge Diagnosis of CVD







Hospital discharge diagnosis of cardiovascular diseases (CVD) provide further insight into the burden of these diseases across Europe, and differences in health care resources. Discharge diagnoses of CVD in the Southern and Western part of Europe are less frequent than in the Northern and Eastern part although this gradient is rather flat. At present, the average number of hospital discharges for CVD in the European population is 26.3 per 1,000 inhabitants, which is lowest with 22.8 for the EU-15 countries, and highest for the CIS: 27.8 per 1,000 inhabitants. Of all hospital discharges in the European Region, about 40% is due to CVD.

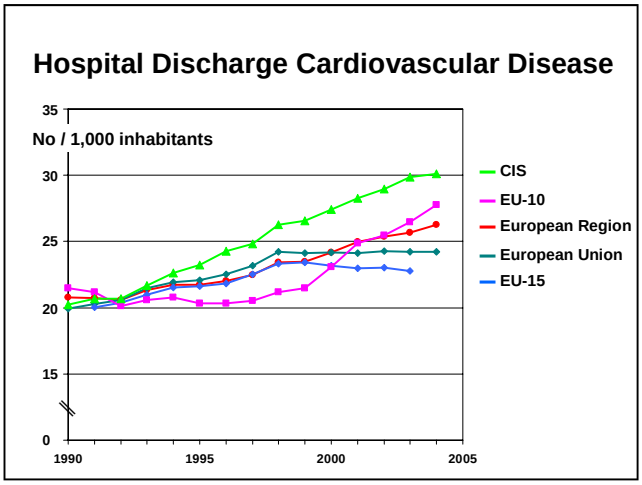
The more specific number of hospital discharges for ischemic heart disease and the number of hospital discharges for cerebrovascular disease present a similar pattern as the number of hospital discharges for cardiovascular diseases. At present, the average number of hospital discharges for ischemic heart diseases in the European population is 8.7 per 1,000 inhabitants, which is lowest with 6.5 for the EU-15 countries, and highest for the CIS: 11.1 per 1,000 inhabitants. The average number of hospital discharges for cerebrovascular diseases in the European population is 4.9 per 1,000 inhabitants, which is lowest with 3.8 for the EU-15 countries, and again highest for the CIS: 5.8 per 1,000 inhabitants.

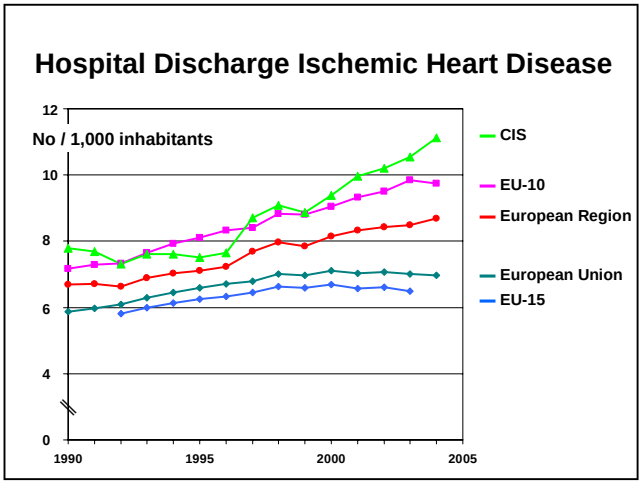
Since 1990, the number of hospital discharges for cardiovascular diseases, ischemic heart diseases, and cerebrovascular diseases increased in most countries. The average number of hospital discharges for cardiovascular diseases of the European population

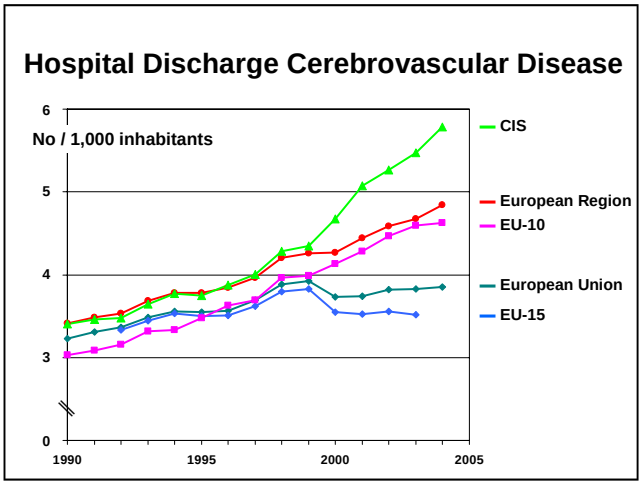
Hospital Discharge Diagnosis of CVD

increased by 26% from 20.8 to 26.3 per 1,000 inhabitants. For the European Union this figure increased similarly but stabilised since 1998. In the EU-15 countries, the average number of hospital discharges for cardiovascular diseases increased by 17% between 1991 and 1999, from 20.0 to 23.4 per 1,000 inhabitants. After 1999 the number of hospital discharges with cardiovascular diseases slightly decreased by 3% to 22.8 per 1,000 inhabitants. In contrast, in the EU-10 the average number of hospital discharges with cardiovascular diseases was more or less stable around 21.0 per 1,000 inhabitants until 1998, where after a steep 32% increase occurred to 27.8. The average number of hospital discharges for ischemic heart diseases of the European population increased by 29%, and the number of hospital discharges for cerebrovascular diseases by 41%.

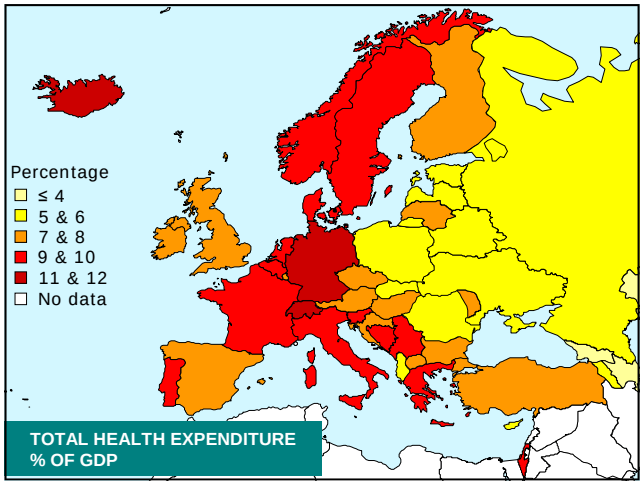
Considering the above European regions, discharge diagnoses of cardiovascular diseases are approximately proportional to the cardiovascular mortality rate. There are, however, some exceptions. In France, for example, the 2004 mortality rate from cardiovascular diseases was low (1.6 per 1,000), but the number of hospital discharges with cardiovascular diseases was intermediate (22.2 per 1,000). Similar exceptions are Austria and Finland. In contrast, mortality from cardiovascular diseases in Kazakhstan was high (8.7 per 1,000) while the number of hospital discharges with cardiovascular diseases was intermediate (17.9 per 1,000). A similar pattern is observed in the Russian Federation and Ukraine.



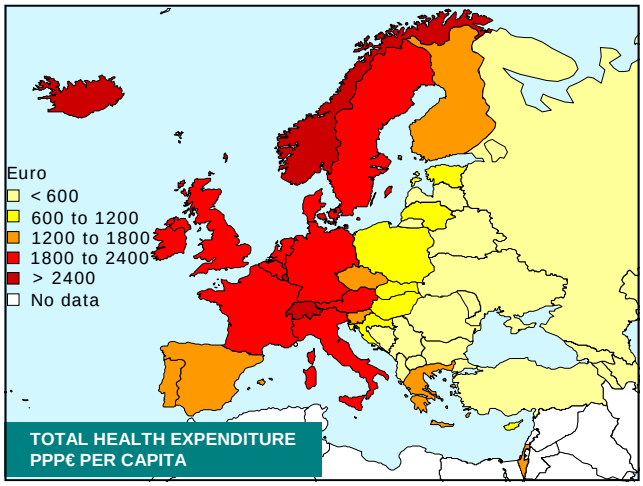




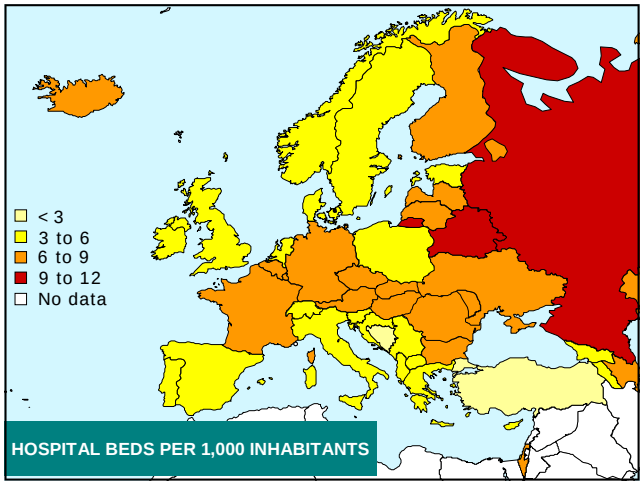
Health Care Resources



Gross Domestic Product (GDP) per capita is often used as an indicator of the standard of living in an economy. The GDP is defined as the market value of all final goods and services produced within a country in a given period of time. Total health expenditure as percentage of GDP in the European Region is on average 7.6%, with 8.9% for the European Union, 9.3% for the EU-15 countries, and lowest for the CIS: 5.3%. The expenditure for health care as percentage of GDP ranges from 3.7% in Azerbaijan to 11.6% in Switzerland.



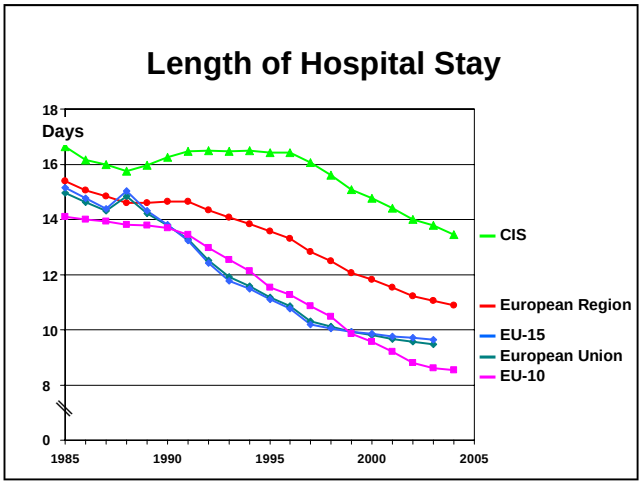
A Purchasing Power Parity (PPP) exchange rate equalises the purchasing power of different currencies in their home countries for a given basket of goods. These special exchange rates are often used to compare the standards of living between countries. The adjustments are meant to give a better picture than comparing GDP using market exchange rates. This type of adjustment to an exchange rate is, however, controversial because of the difficulties of finding comparable baskets of goods to compare purchasing power across countries. Total health expenditure as PPP€ per capita is in the European Region on average 1255, with 1850 for the EU-25, 2060 for the EU-15 countries, and lowest for the CIS: 345. The expenditure for health care as PPP€ per capita ranges from 250 in Armenia to 3079 in Switzerland.

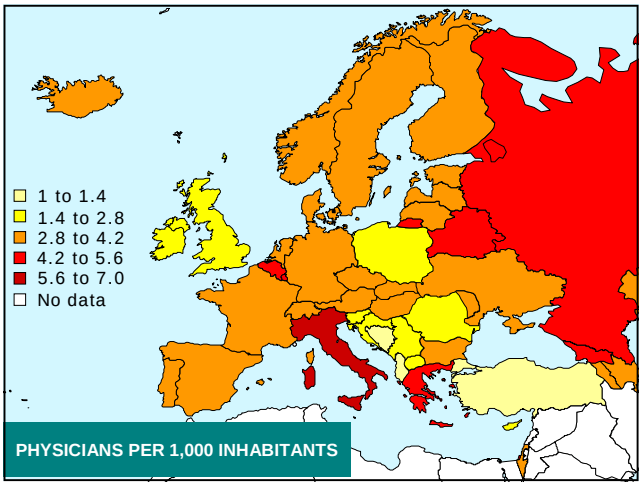


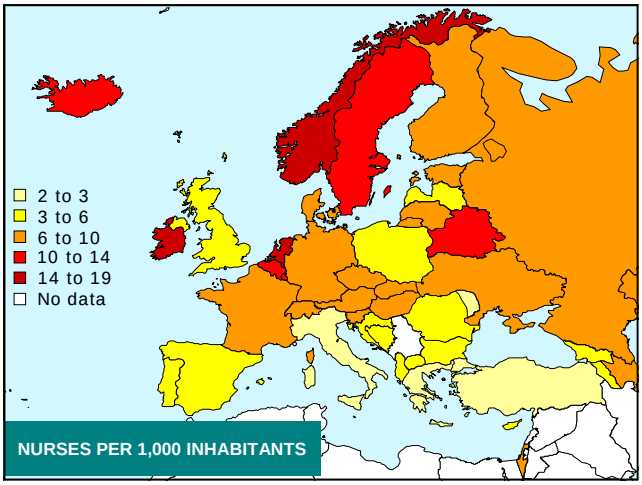
At present, the average number of hospital beds in the European Region is 6.9 per 1,000 inhabitants, 5.9 for the European Union, 5.8 for the EU-15 countries, and highest for the CIS: 8.7 per 1,000 inhabitants. Since 1980, the number of hospital beds decreased

steeply by 30% for the European Region, by 34% for the European Union, by 36% for the EU-15 countries, and by 30% for the CIS. At the same time, the length of hospital stay declined in all parts of Europe. From 1985 to 2004, the average length of hospital stay decreased from 15.4 to 10.9 days in the European Region. For the European Union, a 40% reduction in the length of hospital stay was observed, while for the CIS a smaller reduction of 20% was found.

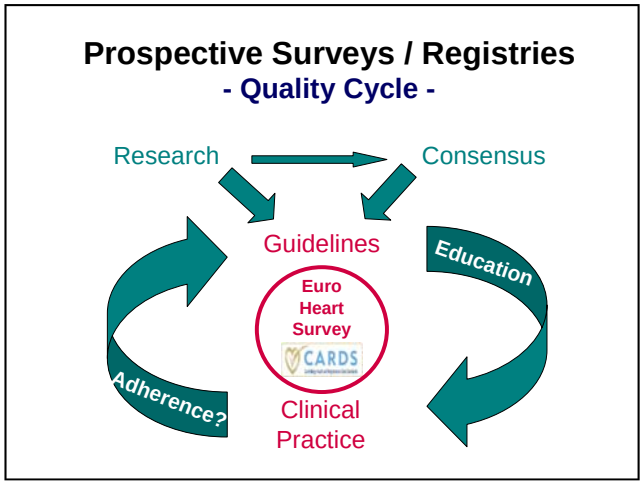
The number of physicians and nurses per 1,000 inhabitants varies between countries. A relatively high number of university graduated and still active physicians is observed in Italy (6.2/1,000), Georgia (4.9), Belarus (4.6), Belgium (4.5), Greece (4.4), and the Russian Federation (4.2), while a relatively low number of physicians is present in Albania (1.2), Turkey (1.4), Bosnia and Herzegovina (1.4), Romania (2.0), and the United Kingdom (2.1). On the other hand, a relatively high number of qualified and active nurses is observed in Ireland (18.8/1,000), Norway (14.8), and the Netherlands (14.0), while a relatively low number of nurses is present in Turkey (2.5), Greece (2.6), and Italy (3.0). The ratio of nurses to physicians varies from 6.8 in Ireland, 4.5 in the Netherlands, and 4.3 in Norway to 0.5 in Italy and 0.6 in Greece. From 1985 to 2004, the average number of physicians in the European Region increased from 3.0 to 3.5 per 1,000 inhabitants; the number of nurses remained fairly stable (6.8 per 1,000 in 1985; 6.7 in 2004).

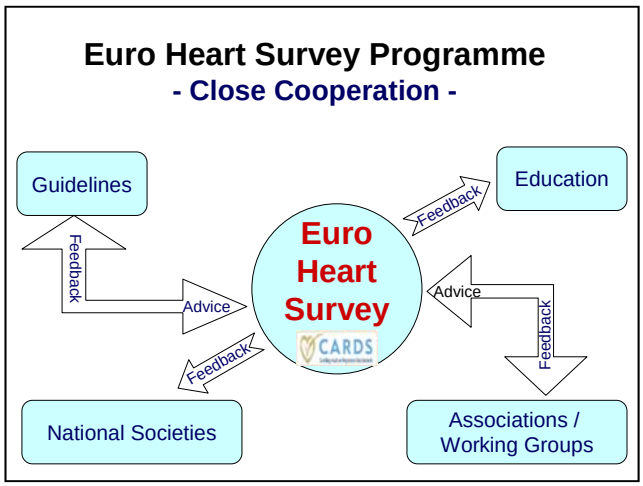






Euro Heart Survey Programme
Aim and Method





Euro Heart Survey Programme

Survey	Year	Patients	Publications
EuroAspire II	1999	8,181	11
Heart Failure I	2000	11,327	8
Heart Failure II	2005	3,390	submitted
Acute Coronary Syndromes I	2000	10,484	19
Acute Coronary Syndromes II	2005	6,302	1
Valvular Heart Disease	2001	5,001	3
Coronary Revascularisation	2002	5,743	3
Stable Angina Pectoris	2003	3,795	6
Diabetes and the Heart	2003	4,961	2
Adult Congenital Heart Disease	2004	4,168	6
Atrial Fibrillation	2004	5,334	3
Percutaneous Coronary Intervention	2005	14,657	Submitted
Total		83,343	62

The *overall aim* of the Euro Heart Survey programme is to describe patient presentation, management and outcome of cardiovascular disease across Europe with the following specific aims:

- To assess adherence to guidelines for prevention, diagnosis and treatment of cardiovascular disease in clinical practice;
- To assess if patients seen in clinical practice are appropriately represented in clinical trials on which guidelines are often based;
- To assess whether differences in practice in hospitals in Europe are reflected in differences in outcome in specific patient groups.

Guidelines for the practice of cardiology and vascular medicine are established by European and other experts appointed by the ESC, often in collaboration with other international professional organisations. European, national and local *education programmes* have been developed to inform physicians about guidelines for patient management. Such education programmes are a crucial part of continuing medical education (CME). *Surveys and registries* of clinical practice such as the Euro Heart Survey programme close the “Quality Circle”.

The conduct of national and international registries and surveys would be greatly facilitated by systematic and standardised data collection in clinical practice. Therefore the ESC, in cooperation with the European Union, initiated the development of Cardiology Audit and Registration Data Standards (CARDS). Data standards have been developed for three priority areas: acute coronary care, interventional cardiology and clinical electrophysiology.[6,7] Other topics will be ad-

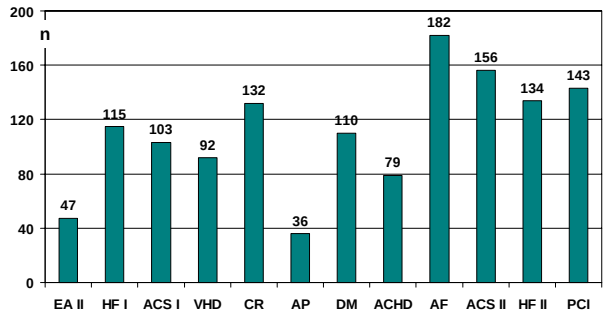
Euro Heart Survey Programme
Aim and Method

dressed in the coming years.

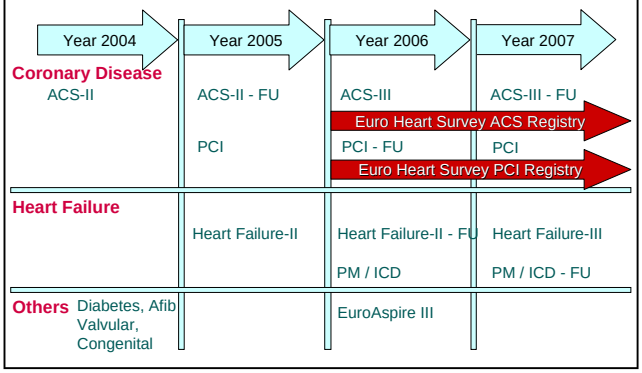
Since 1999, a series of 12 surveys have been completed. The participation in the programme evolved from 47 hospitals and 15 countries participating in 1999 to 182 hospitals and 35 countries participating in the 2004 survey on atrial fibrillation. In order to achieve a better representation of the practice of cardiology throughout Europe, the number of sites has been increased, while the number of patients enrolled at each site has decreased. In the coming years participation of additional hospitals and countries will be further facilitated with online (web based) data entry and standardised patient record forms. The Euro Heart Survey Programme will also continue to offer and improve the benchmarking service for quality assurance for the participating hospitals, and ESC Working Groups and Associations.

Additional surveys are planned for the application of pacemakers and internal cardioverter defibrillator devices. Based on the experiences from national registries, the Euro Heart Survey Programme has moved from a cyclic survey structure to a continuous data collection in ongoing registries. The first two ongoing registries are on Percutaneous Coronary Interventions (PCI), which was launched during the EuroPCR Congress in May 2006, and on Acute Coronary Syndromes (ACS), which will be launched during the World Congress of Cardiology in Barcelona in September 2006. Both registries are scheduled for the upcoming two years. This new methodology will help to transform the Euro Heart Survey Programme into a Quality Assurance Programme with the goal of improving implementation of guidelines and clinical cardiac care and outcome of patients in Europe.

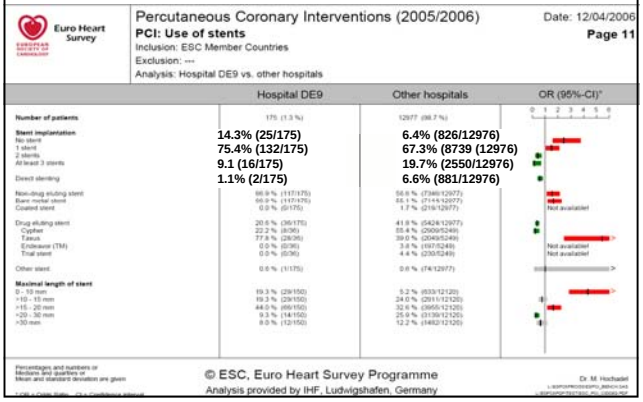
Number of participating hospitals



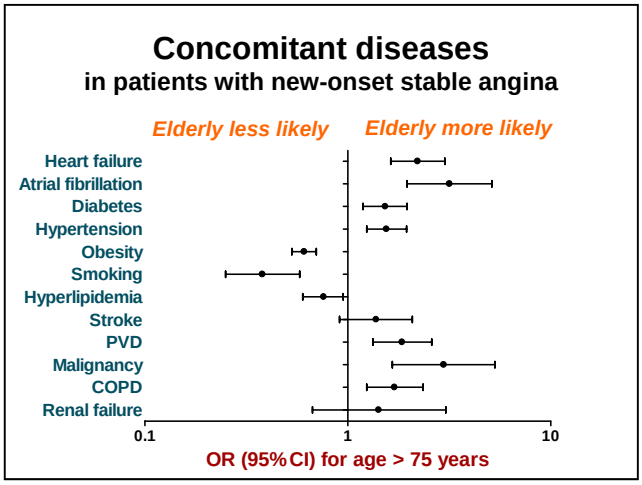
Euro Heart Survey Programme
- Cyclic Structure -

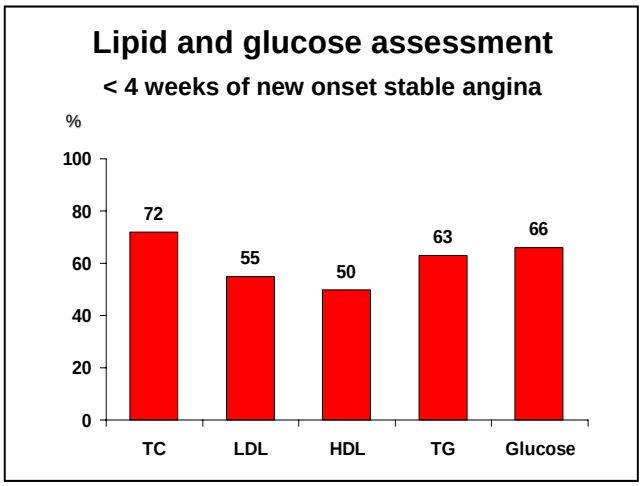


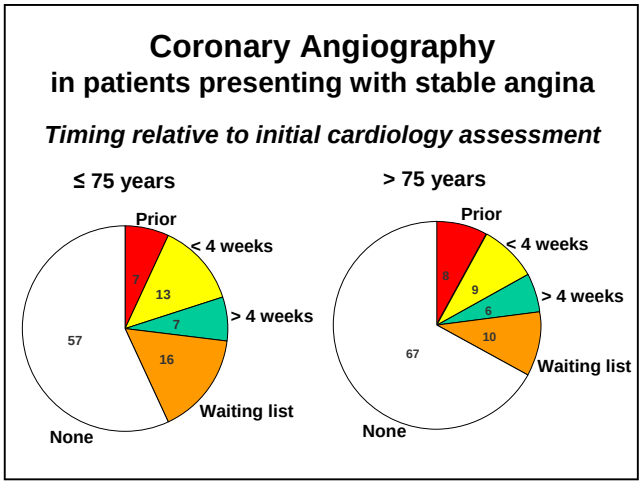
Benchmarking for Quality Control



Stable Angina 2003







The Euro Heart Survey on Stable Angina Pectoris (2003) included 3,779 ambulatory patients from 36 countries, presenting to a cardiologist as an outpatient, with new-onset stable angina. The 197 participating hospitals were a mix of hospitals with non-invasive diagnostic facilities only (33%), with both non-invasive and invasive cardiology (19%), and hospitals with both invasive cardiology and cardiac surgery on site (31%).[53-58]

As expected, elderly had more concomitant diseases than younger patients. In general, however, the survey documents a relatively young population (mean age of 61) with a high prevalence of modifiable cardiovascular risk factors with mild to moderate angina without heart failure.[53] These patients are at increased risk by virtue of their symptoms, but for the most part have not yet suffered major adverse cardiovascular events. They will benefit from intensive risk modification. Yet, there is a clear gap between the guidelines and practice with regard to the management of cholesterol and glucose. For example, only 72% of patients had a cholesterol measurement performed within 4 weeks of assessment. Mean cholesterol level was 5.8 mmol/L, and just one-third of patients taking statin had achieved the target (5 mmol/L) cholesterol.[54]

Coronary angiography (CAG) was planned or performed in 41% of patients, with considerable regional variation. There was frequently considerable delay before performance of the test. Exercise ECG as well as CAG were less often performed in elderly. Elderly who underwent exercise ECG and

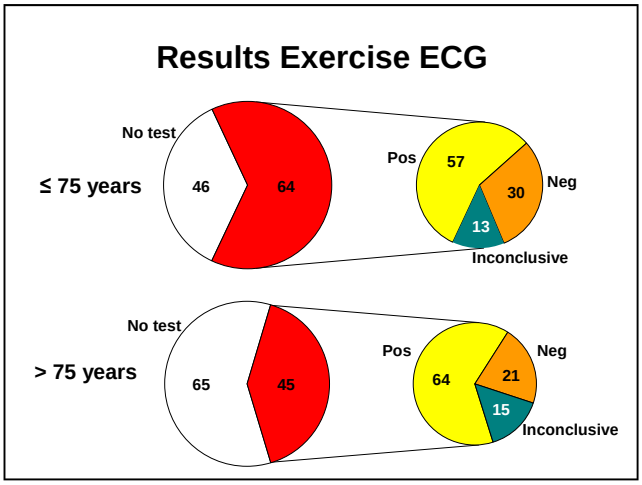
CAG more often had abnormal test results than their younger counterparts (no significant narrowings in only 20% of those aged 75 and over versus 5% in counterparts).

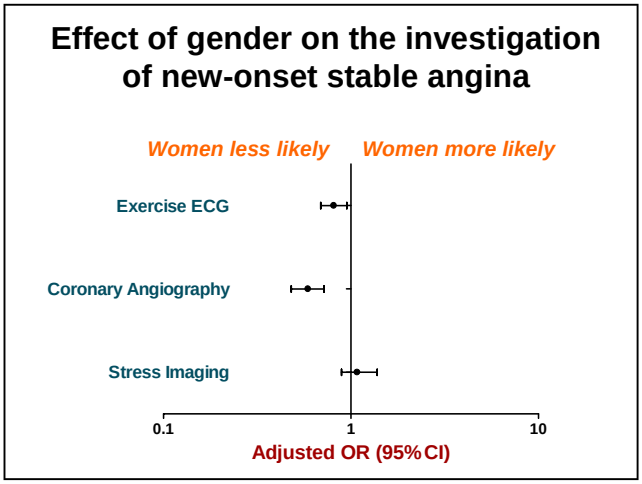
Women were less likely to be referred for exercise ECG and CAG, even after multivariable adjustment.[57] Nevertheless, women more often had no significant narrowings than men. Antiplatelet and statin therapies were used significantly less in women than in men, and women with confirmed coronary disease were less likely to be revascularised than their male counterparts and were twice as likely to suffer death or nonfatal myocardial infarction during the 1-year follow-up period, even after multivariable adjustment.[55]

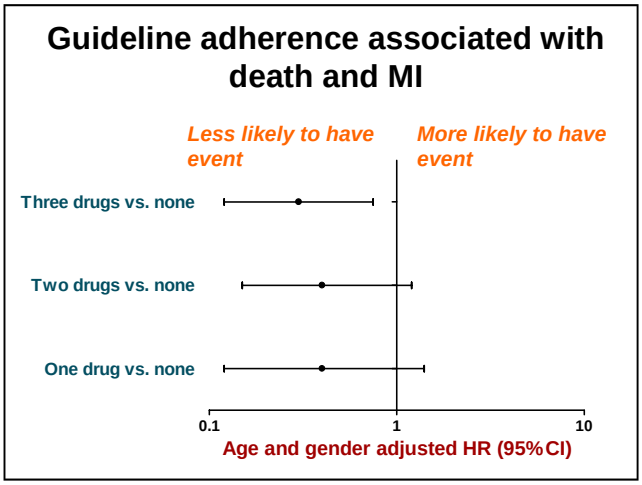
Increasing intensity of guideline compliant therapy was associated with a reduction in death and myocardial infarction (MI) during follow-up in patients with angina and confirmed coronary disease (HR 0.68; 95% CI 0-49-0.95 per unit increase in treatment score).[56]

Conclusion:

(1) Cardiovascular disease prevention should be applied more often.
(2) In the elderly, diagnostic procedures could be used more frequently.
(3) In women, non invasive and invasive diagnostic procedures should be considered more often as well as coronary revascularisation.
(4) Guideline compliant medical therapy improves clinical outcome in patients with stable angina and objective evidence of coronary disease.

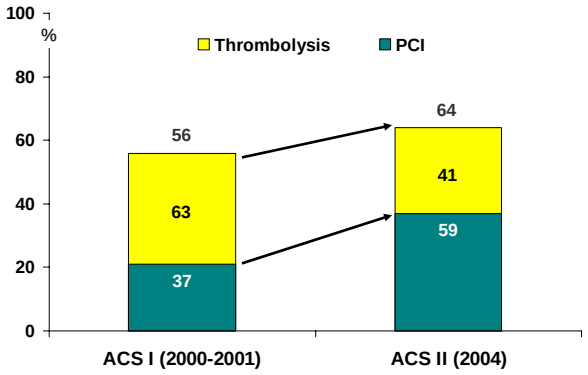






Acute Coronary Syndromes I & II 2000-2001 & 2004

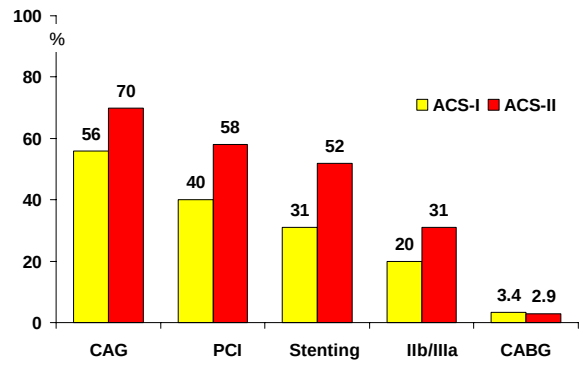
Primary Reperfusion Therapy in STEMI



Median Time to Reperfusion in STEMI

	ACS I		ACS II
Symptom onset to ER [min]	176	↓	145
ER to Reperfusion [min]	59	↓	53
Thrombolysis [min]	40	→	37
Primary PCI [min]	93	↓	70

Coronary Interventions in STEMI



The Euro Heart Survey on Acute Coronary Syndromes I (ACS-I) included 10,484 patients with a discharge diagnosis of ACS. These patients were enrolled during 2000-2001 in 103 hospitals from 25 countries.[27-45] Euro Heart Survey ACS II was carried out in 2004 and included 6,385 patients from 190 hospitals in 32 countries with a final diagnosis of ACS.[46] Of the 25 countries participating in ACS-I, 23 also participated in ACS-II. Among the 190 hospitals participating in ACS-II were 34 hospitals that had also participated in ACS-I.

Type of ACS was fairly comparable between ACS-I and ACS-II with 42% and 47% having ST elevation.[46] In both surveys mean age was 65 years and just over two-third were men. Comorbid conditions were also fairly comparable between the two surveys, although prior MI was less often present in ACS-II patients (16% vs. 22% in ACS-I).

Primary reperfusion therapy in patients with ST elevation myocardial infarction (STEMI) was provided more often in ACS-II (64% vs. 56% in ACS-I), with a larger proportion receiving primary PCI (37% of patients; 59% of reperfusion therapy). Time between symptom onset and arrival at the emergency room (ER) was shorter in ACS-II (145 vs. 176 minutes in ACS-I), and also the time period between ER and reperfusion by primary PCI was shorter in ACS-II (70 minutes vs. 93 in ACS-I). The major reasons for not providing primary reperfusion therapy in 36% of ACS-II patients were late arrival (30%), uncertain diagnosis (11%), early resolution of ST-elevation (12%), and contraindications (7%).

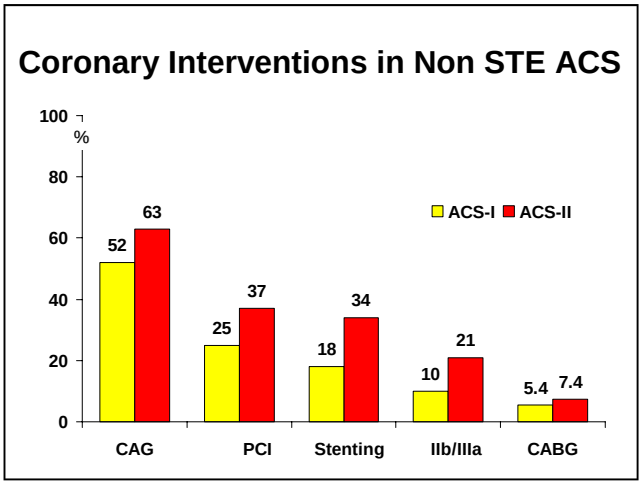
Acute Coronary Syndromes I & II
2000-2001 & 2004

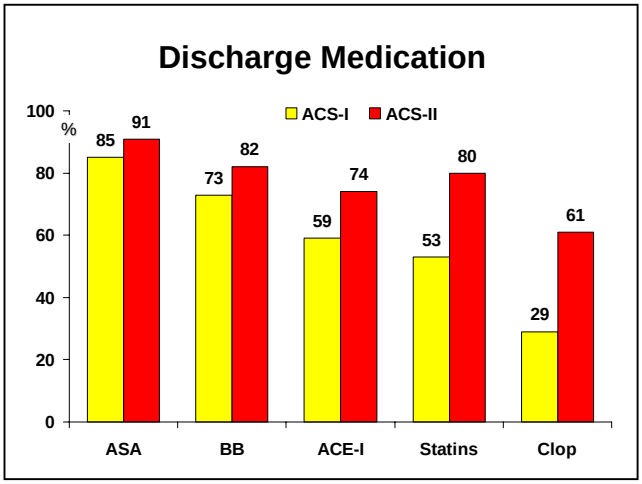
From 2000 to 2004 the application of coronary interventions in STEMI patients increased. Coronary angiography (CAG) was performed in 70% of ACS-II patients compared to 56% in ACS-I. An increasing number patients received a percutaneous coronary intervention (PCI) (40% in ACS-I; 58% in ACS-II), and the proportion of patients receiving stents increased from 31% in ACS-I to 52% in ACS-II. The increase in the proportion of patients undergoing CAG, PCI, and stent implantation among those hospitalised in the 34 centres that participated in both ACS-I and ACS-II was even greater than in the full ACS-I and ACS-II cohorts.

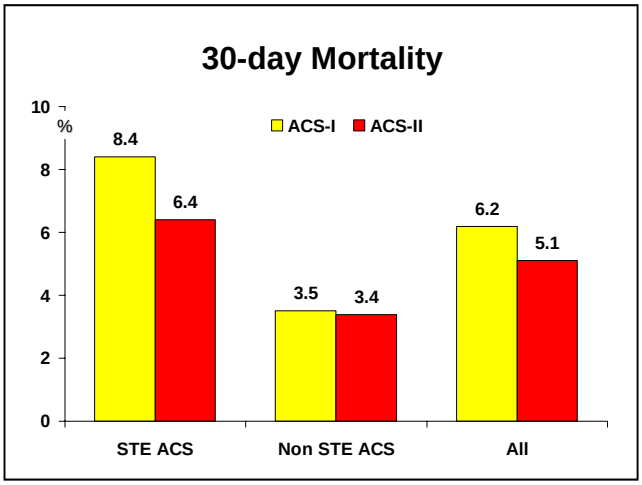
In patients with non ST elevation (Non STE) ACS the application of coronary interventions also increased between ACS-I and ACS-II. A higher number of patients was referred for CAG (52% in ACS-I to 63% in ACS-II), an increasing number patients received PCI (25% in ACS-I to 37% in ACS-II), and also stenting was applied more often (18% in ACS-I to 34% in ACS-II).

The prescription rate of discharge medication increased between the ASC-I and ACS-II surveys. Antiplatelets, beta-blockers, ACE-inhibitors, statins and clopidogrel were all prescribed more frequently. A relatively high increase was observed for statins (from 53% in ACS-I to 80% in ACS-II) and the prescription rate of clopidogrel even doubled from 29% in ACS-I to 61% in ACS-II.

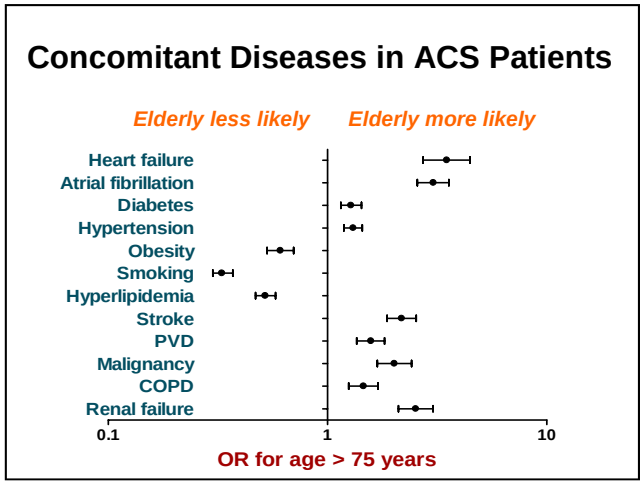
30-day mortality in Non STE ACS patients remained similar between ACS-I and ACS-II (3.5% to 3.4%), and decreased in STE ACS patients from 8.4% to 6.4%.

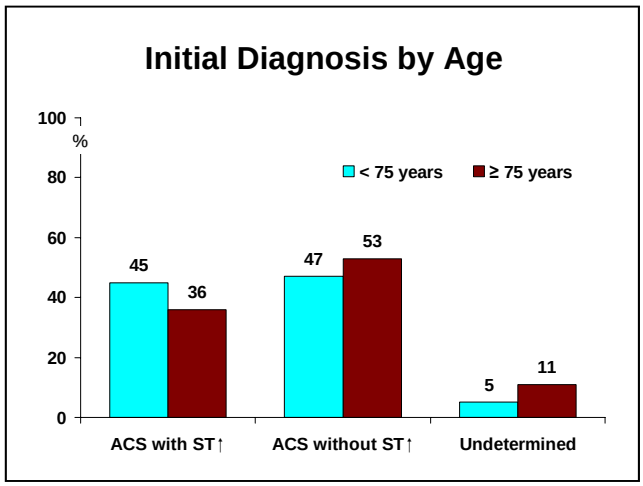


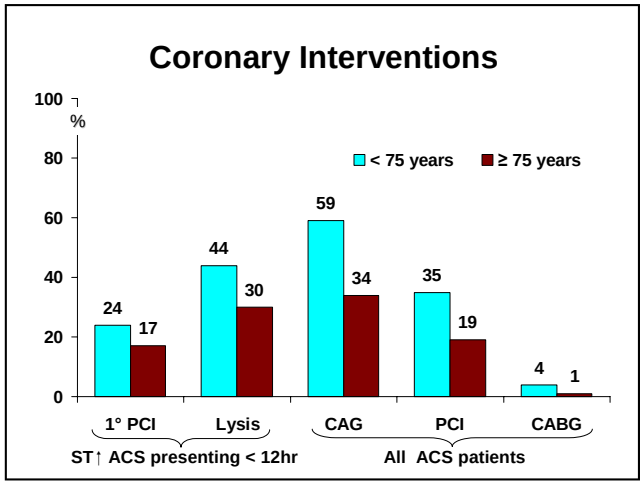




Acute Coronary Syndromes I & II 2000-2001 & 2004







As expected, elderly ACS patients (ACS-I) were more likely to have concomitant diseases, especially heart failure and atrial fibrillation. Elderly ACS patients less often presented with ST-elevation (36% vs. 45% in younger patients).[45] The proportion of ST-elevation ACS decreased with age, also after adjusting for potential confounders. Among patients with ST-elevation presenting within 12 hours, reperfusion therapy was less often applied in the elderly. Only 17% of patients older than 75 years of age were treated with primary Percutaneous Coronary Intervention (PCI) compared with 24% of younger patients. Of patients older than 85 only 26% received thrombolysis or primary PCI, while 71% of patients younger than 55 years of age received reperfusion therapy. Also coronary angiography (CAG) was less frequently performed in elderly ACS patients (59% vs. 34%), as well as elective PCI (19% vs. 35%), and coronary artery bypass surgery (CABG). Discharge medication in ACS-I was overall less prescribed than recommended by recent guidelines, especially in the elderly. All medications, and in particular statins (36% vs. 57% in younger patients) were less often prescribed in the elderly. As expected, hospital mortality was much higher in elderly patients, even after considering potential confounders.

The Euro Heart Survey Programme provides the opportunity to study relatively small patient populations, such as patients with cardiogenic shock.[39] In ACS-I cardiogenic shock occurred in 5.2% of all patients, of whom 29% had cardiogenic shock upon presentation. There were no significant differences between ACS patients with and without cardiogenic shock in referral to CAG

(52% vs. 53%, respectively) or for CABG (4.4% vs. 4.5%), but patients with cardiogenic shock were more likely to undergo PCI (41% vs. 32%) and intra-aortic balloon pump (IABP) (18% vs. 1%). Especially younger (< 75 years) patients with cardiogenic shock more often received PCI (52% vs. 36% in patients without cardiogenic shock < 75 years). In elderly ACS patients, invasive strategies were as often applied in patients with as in patients without cardiogenic shock. In general, the application of invasive therapies is less than recommended by recent guidelines advocating an aggressive approach in ACS patients with cardiogenic shock. The in-hospital mortality was very high for all patients with cardiogenic shock: 52% vs. 2.0% in all others.

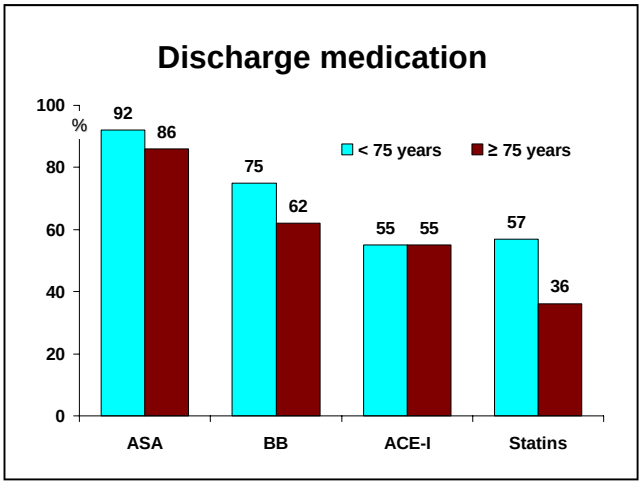
Conclusion:

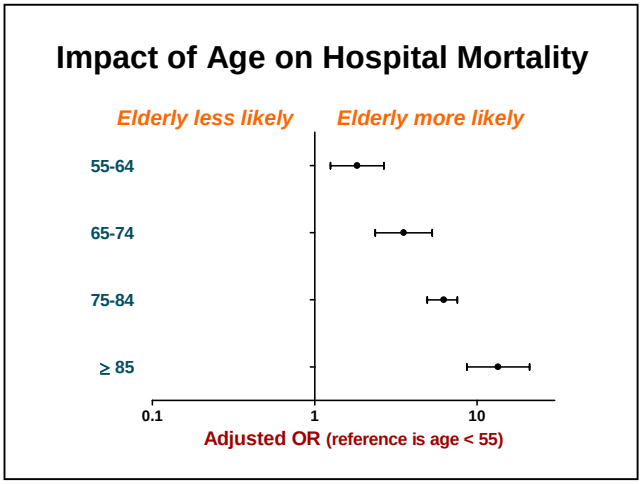
(1) The use of recommended medical therapy as well as outcome improved between ACS-I and ACS-II.

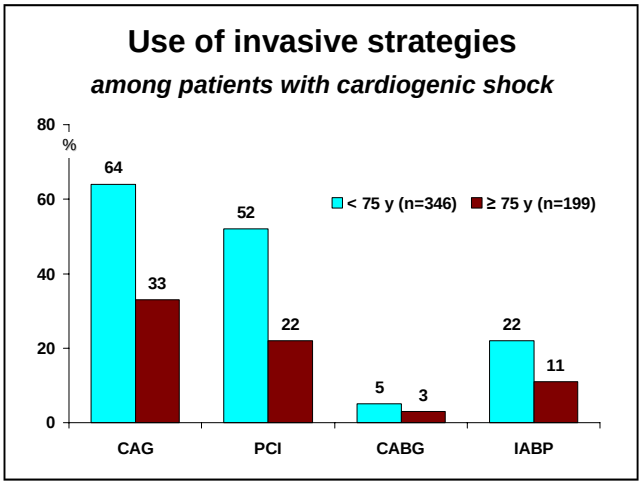
(2) Elderly ACS patients have more concomitant diseases, but may benefit from more frequent application of reperfusion therapy, coronary interventions and medical adjunctive therapy.

(3) Elderly ACS patients were less likely to present with ST-elevation but had substantial in-hospital mortality.

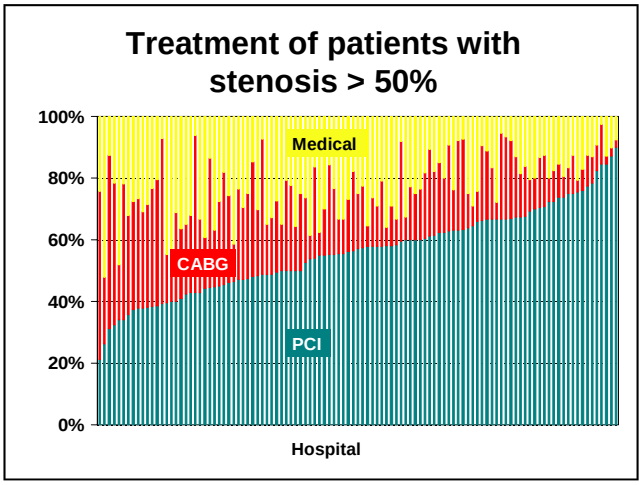
(4) ACS-patients with cardiogenic shock, particularly elderly patients, may benefit from a more aggressive approach.

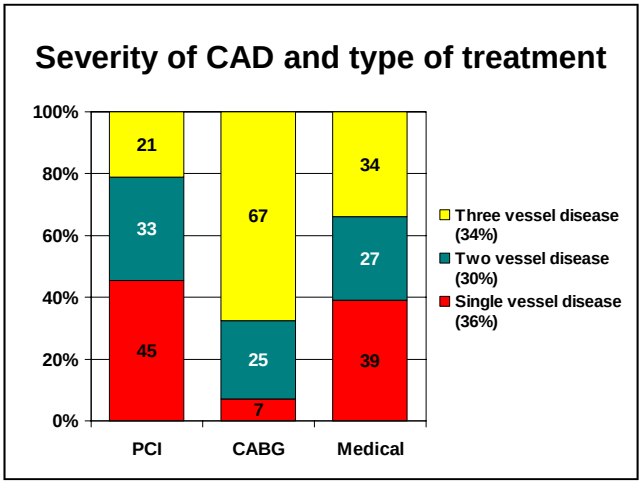


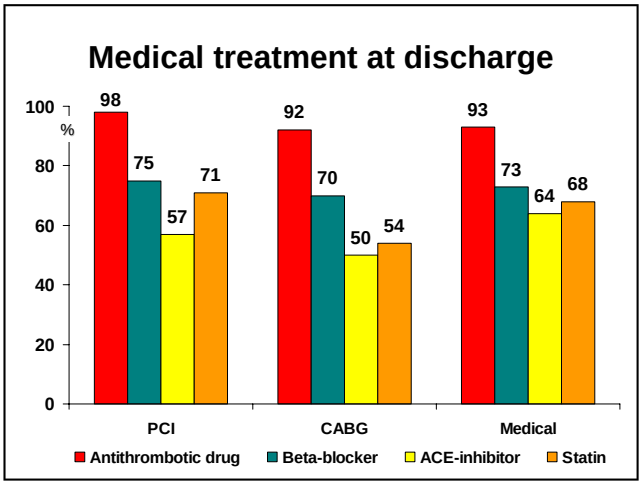




Coronary Revascularisation 2001-2002







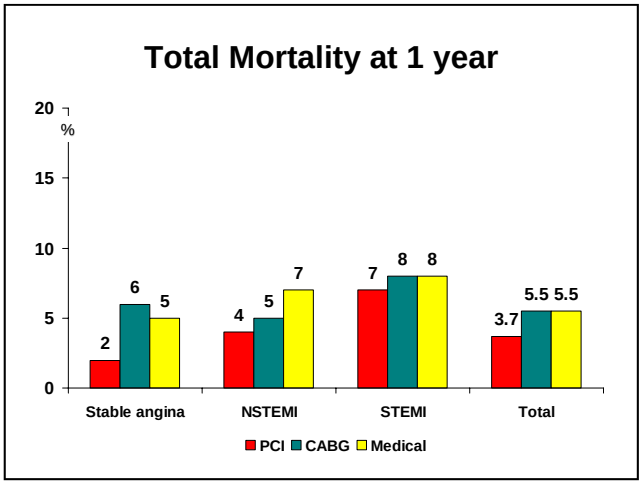
The Euro Heart Survey on Coronary Revascularisation included consecutive patients who presented for coronary angiography and had significant coronary disease (any stenosis over 50% in diameter). In 2000-2001, over 8,000 procedures were screened and 5,767 cases were included from 132 hospitals of 31 ESC member countries.[50-52]

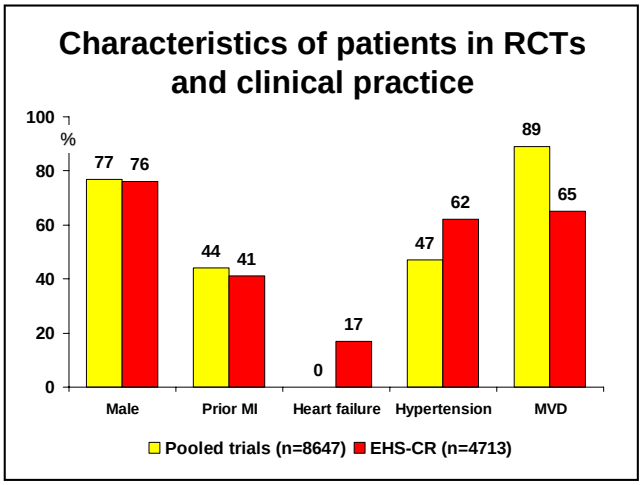
In patients presenting with evolving myocardial infarction, immediate coronary revascularisation by means of a 'primary' percutaneous coronary intervention (PCI) is nowadays considered the best treatment option, as it is more effective and safer than fibrinolysis. In other acute coronary syndromes revascularisation should be considered in high risk patients. In clinical practice, however, indications for revascularisation seem to be determined as much by availability as by risk assessment. The percentage of invasive (PCI and CABG) and non-invasive treatment in patients with a stenosis over 50% varied largely across hospitals.[50] Also the prescription of other recommended treatments, such as stenting and GP IIb/IIIa receptor blockers in PCI patients varied largely between hospitals.

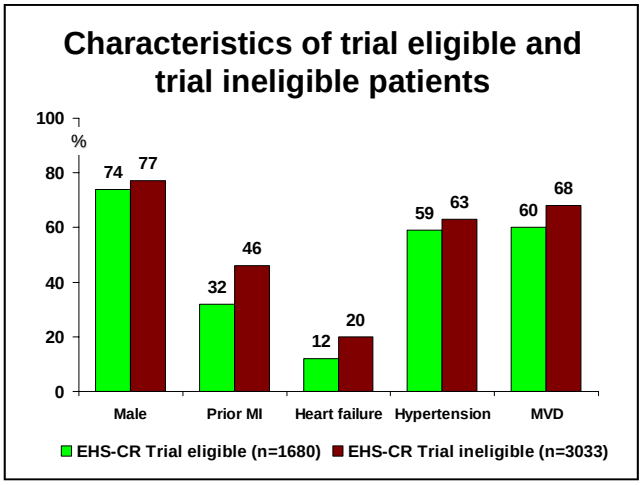
Just over half of patients (53%) with angiographically proven coronary stenosis presented with stable angina while ST elevation myocardial infarction (STEMI) was the indication for coronary angiography in 16% and non-ST segment elevation myocardial infarction (NSTEMI) or unstable angina in 30%. Only medical therapy was continued in 21%, whereas mechanical revascularisation was performed in the remainder (PCI in 58% and CABG in 21%). Patients referred for PCI were younger, more active, had a lower risk

profile, and had less comorbid conditions. CABG was performed mostly in patients with left main lesions (21%), or two- (25%), or three-vessel disease (67%). Single-vessel PCI was performed in 82% of patients with either single- (45%), two- (33%), or three-vessel disease (21%). Stents were used in 75% of attempted lesions, with a large variation between sites. The survey identified under-use of adjunctive medication (GP IIb/IIIa receptor blockers, statins, and ACE-inhibitors). The lowest prescription rates were observed in patients undergoing CABG. Mortality rates at 1 year were low in all subgroups, with 3.7% for PCI patients, and 5.5 in both CABG and only medically treated patients.

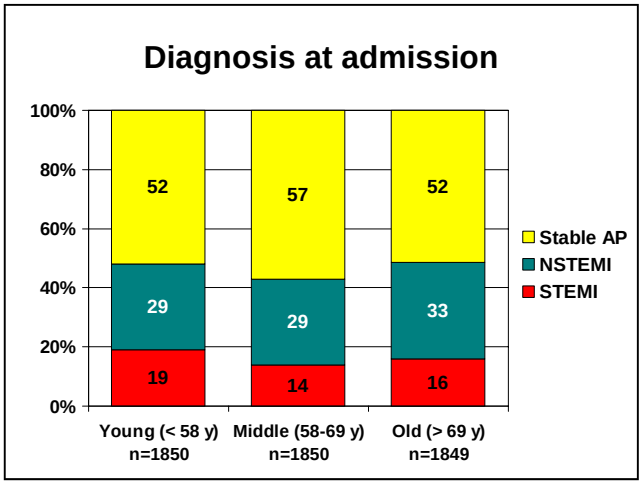
Many patients in clinical practice were not represented in RCTs.[51] Only 36% of patients in clinical practice would have been considered eligible for participation in a trial comparing PCI and CABG. Patients in clinical practice were older, more often had comorbid conditions, single-vessel disease, and left main stenosis as compared with trial participants. Trial-eligible survey patients less often had comorbid conditions and multivessel disease (MVD) than trial ineligible survey patients. In clinical practice, PCI was most often the treatment of choice, even in patients who were trial-ineligible (46% PCI, 26% CABG, 28% medical). PCI remained the preferred treatment option in patients with MVD (57% in trial-eligible and 40% in trial-ineligible patients, respectively). Yet, the risk profile of patients treated by PCI was better than that for patients treated either by CABG or by medical therapy. In the RCTs, there was no mortality difference between PCI and CABG. In clinical practice, however, a 1-year

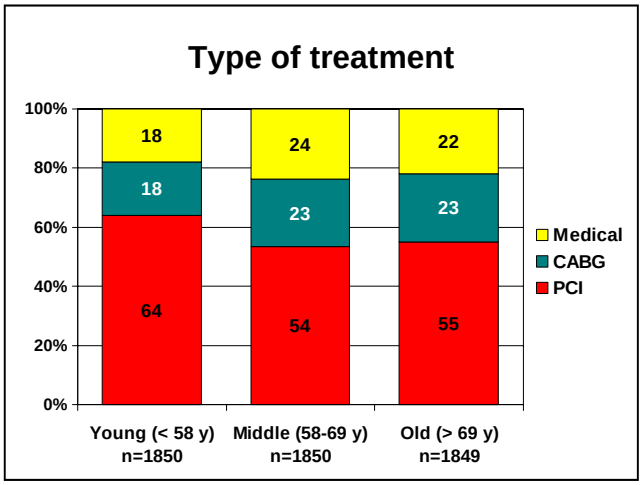


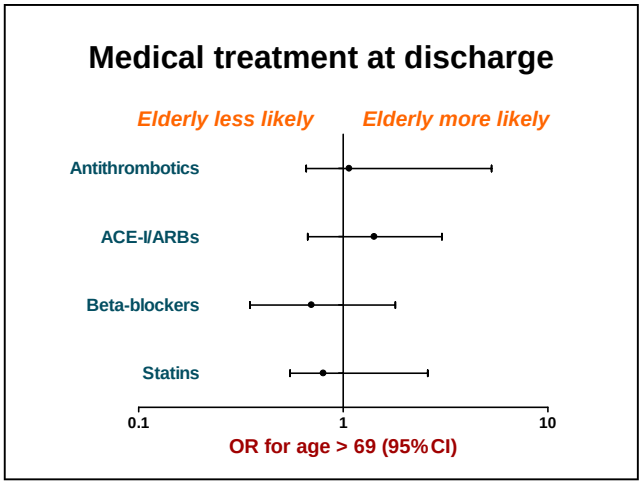




Coronary Revascularisation 2001-2002







unadjusted survival benefit was observed for PCI vs. CABG in trial-ineligible patients (3.3 vs. 6.2%, P<0.001).

The clinical presentation on admission was comparable for all age groups. Stable angina was present in about half of patients, and NSTEMI in nearly one-third. In the elderly, however, MVD was observed more often compared to the younger age groups, and also comorbid conditions, such as stroke, congestive heart failure, and chronic obstructive pulmonary disease were present more frequently. Despite worse conditions, the percentage of invasive and non-invasive treatment in elderly patients with an angiographically proven stenose over 50% did not differ significantly from patients in the middle age group.

Message:

(1) The percentage of invasive (PCI and CABG) and non-invasive treatment in patients with a stenose over 50% varied largely across hospitals.

(2) Under-use and a large hospital variety in the prescription of adjunctive medication (GP IIb/IIIa receptor blockers, statins, and ACE-inhibitors), were observed, with the lowest prescription rates in CABG patients.

(3) Most patients in clinical practice are not represented in RCTs.

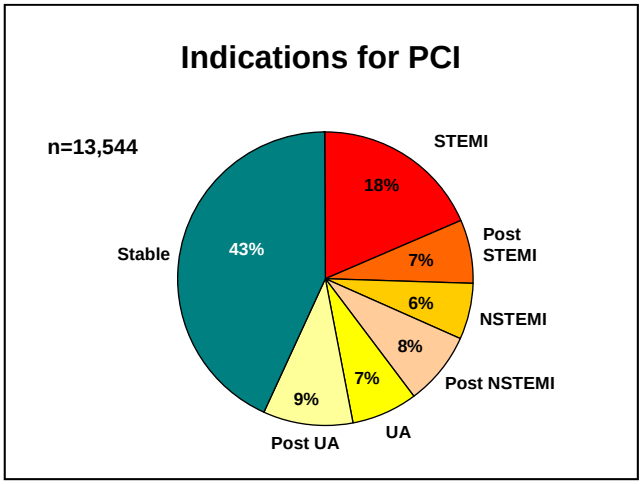
(4) The percentage of invasive and non-invasive treatment in elderly patients with an angiographically proven stenose over 50% did not differ from patients in the middle age group. Also the prescription of adjunctive medication did not differ for the elderly.

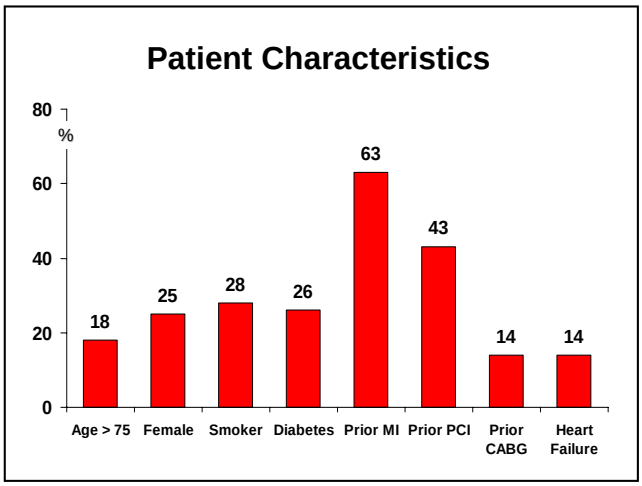
Percutaneous Coronary Intervention 2005-2006

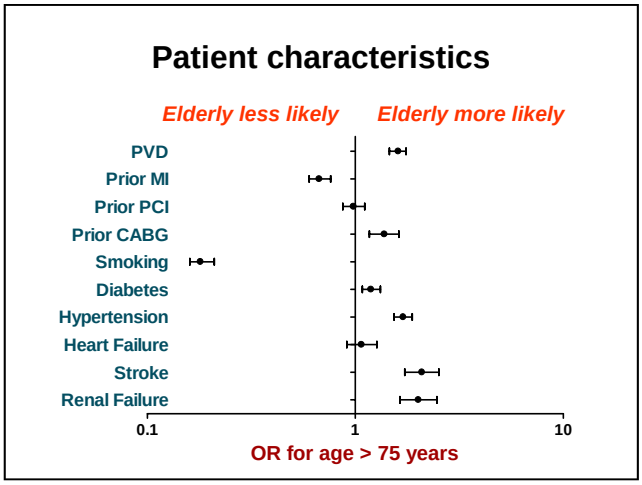
Between June 2005 and January 2006, the Euro Heart Survey on Percutaneous Coronary Interventions (PCI) included 13,544 patients in 143 hospitals from 30 ESC member countries. The Euro Heart Survey on PCI became a PCI registry in 2006 and currently includes over 20,000 patients.

Of all PCI procedures in this survey, ST elevation myocardial infarction (STEMI) was the indication for PCI in 25% of cases, non ST elevation myocardial infarction (NSTEMI) in 14%, unstable angina (UA) in 16%, and stable angina in 43% of cases. Overall, 43% of PCIs were elective with a relatively low number of elective PCIs in the elderly (38% vs. 44% in younger patients). Over a quarter of patients (27%) were transferred from an other hospital. In STEMI patients receiving primary PCI the median delay from symptom onset to PCI was 3 hours and 26 minutes (inter-quartile range 1:50-6:45 hr). For elderly, this time delay was significantly longer (3:59, 1:62-7:24 hr).

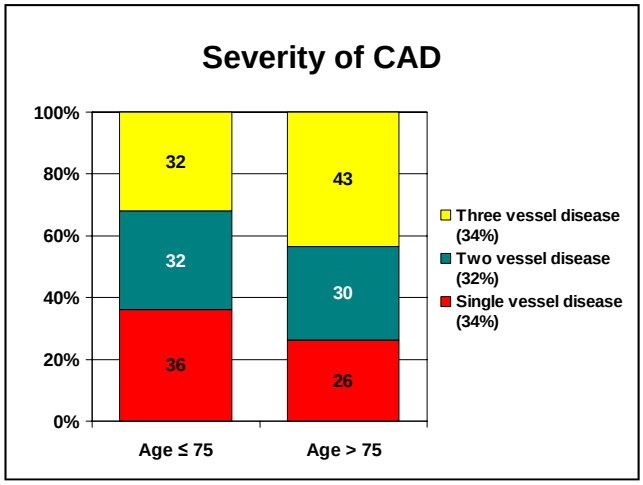
Mean age of this survey population was 64 years, and 18% were older than 75 years of age. A quarter of the PCI population is female, and 28% smokes, with a relatively low number of smokers in the elderly (8% vs. 32% in younger patients). Diabetes was reported in 26% of patients, of which 3% was newly diagnosed. Prior myocardial infarction (MI) was present in 63% of patients, 43% had a prior PCI, and 14% prior coronary artery bypass surgery (CABG), with a relatively high number of prior CABG for the elderly (17% vs. 13% in younger patients). A history of heart failure was reported in 14% of patients, stroke in 8%, peripheral vascular

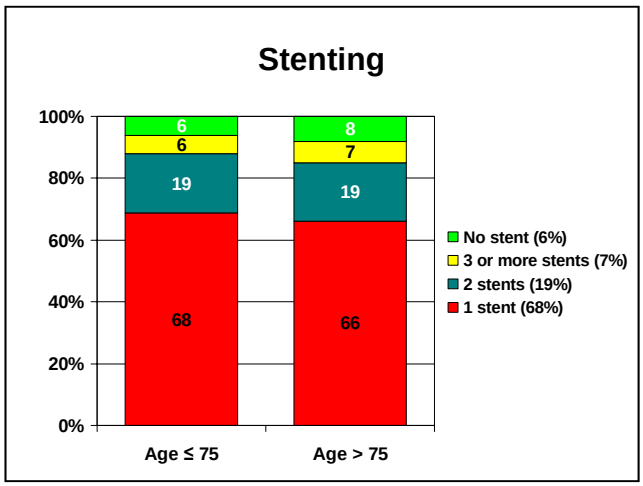


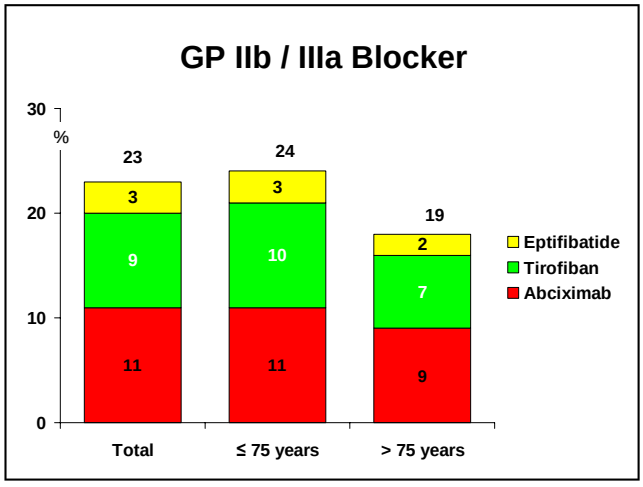




Percutaneous Coronary Intervention 2005-2006







disease (PVD) in 13%, and chronic renal failure in 7%. As expected, the prevalence of PVD, stroke, and renal failure was relatively high in the elderly (17%, 13%, and 11%, respectively).

The prevalences of one, two, and three vessel diseases were almost equal in PCI patients in 2002 and 2006. Like in the earlier Euro Heart Survey on Coronary Revascularisation in 2001-2002, elderly more often had three vessel disease (43% vs. 32% in younger patients), and more often had a stenosis in the left main stem (15% vs. 8% in younger patients). In most cases (69%), one segment was treated, in 23% two segments, and in 8% at least three segments. In 16% of patients a bifurcation was involved, and 7% concerned restenosis.

In the large majority of PCI patients stenting was applied (94%), which is a steep increase in the use of stenting compared to 75% of PCI patients receiving a stent in the earlier Euro Heart Survey on Coronary Revascularisation in 2001-2002. Most patients received one stent (68%), 19% two, and 7% of patients received three or more stents. A drug eluting stent (DES) was provided in only 41% of patients, with 38% in the elderly vs. 42% in younger patients. The use of DES varied widely between countries with high numbers in Switzerland (70%), Portugal (68%), and the United Kingdom (67%), and low numbers in others like Germany (21%).

GP IIb/IIIa receptor blockers were prescribed in only 23% of PCI patients, which is even less than 27% of PCI patients in the Coronary Revascularisation survey in 2001-2002. Most patients received Abciximab

Percutaneous Coronary Intervention 2005-2006

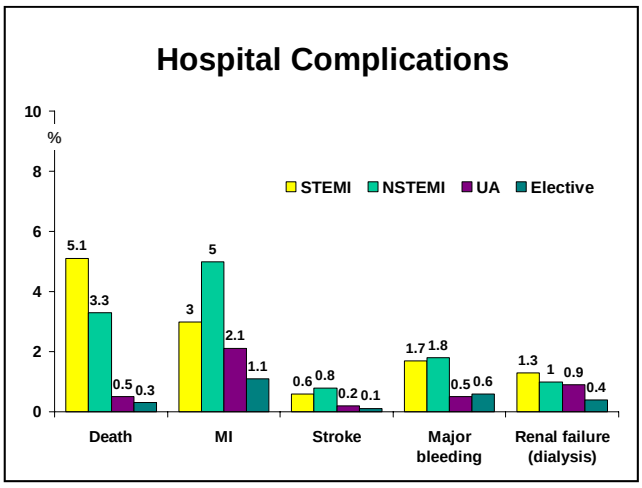
(11%), 9% Tirofiban, and 3% Eptifibatide. Elderly were even less often treated with GP IIb/IIIa receptor blockers than younger patients (19% vs. 24%).

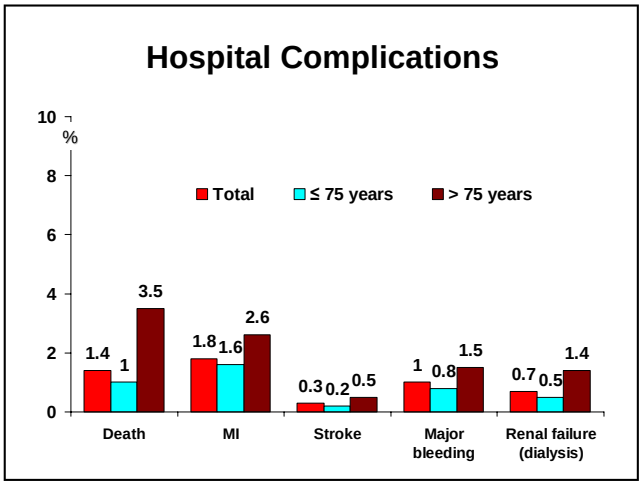
As expected, hospital mortality was highest in STEMI patients (5.1%), and NSTEMI patients (3.3%). Post procedure MI was observed in 3% of STEMI and 5% of NSTEMI patients. All types of hospital complications occurred more often in the elderly, with 3.5% mortality, 2.6% MI, 0.5% stroke, 1.5% major bleedings, and 1.4% developing renal failure requiring dialysis.

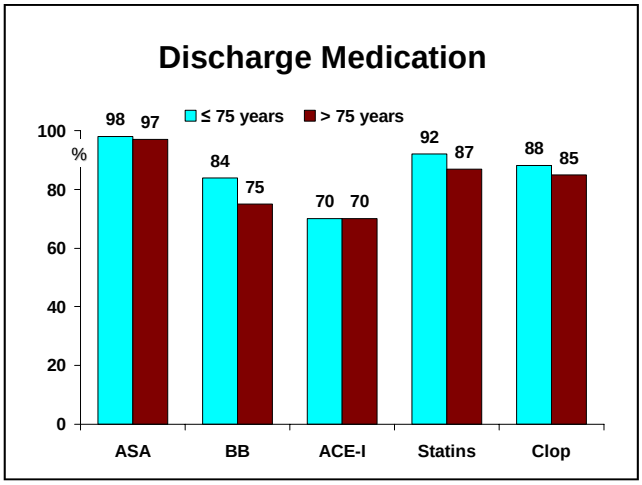
At hospital discharge, the majority of patients were prescribed antithrombotics (98%), beta-blockers (82%), statins (91%), and clopidogrel (86%). ACE-inhibitors were prescribed in 70% of patients, with equal numbers for elderly and younger patients. Beta-blockers, statins, and clopidogrel were significantly less often prescribed in elderly.

Conclusion:

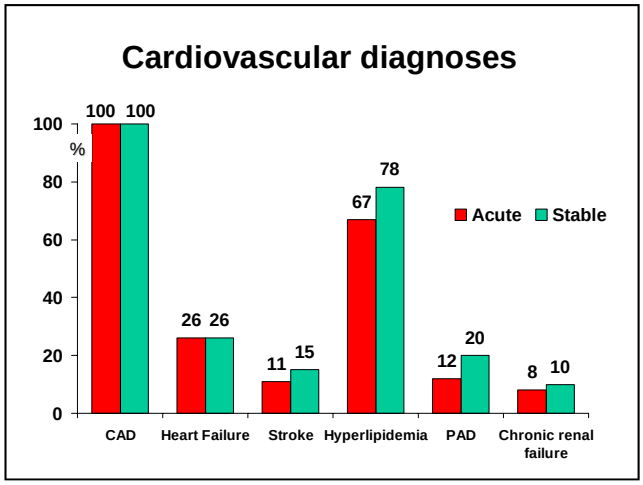
(1) Two-thirds of PCI patients had multivessel disease, which was almost three-quarters in the elderly.
(2) In the large majority of PCI patients stenting was applied. Less than half received DES, and a large variation in DES use was observed between countries.
(3) Only a small number of patients undergoing PCI did receive GP IIb/IIIa blockers as adjunctive treatment.
(4) Medical treatment for secondary prevention after PCI was well according to guidelines, also in the elderly.

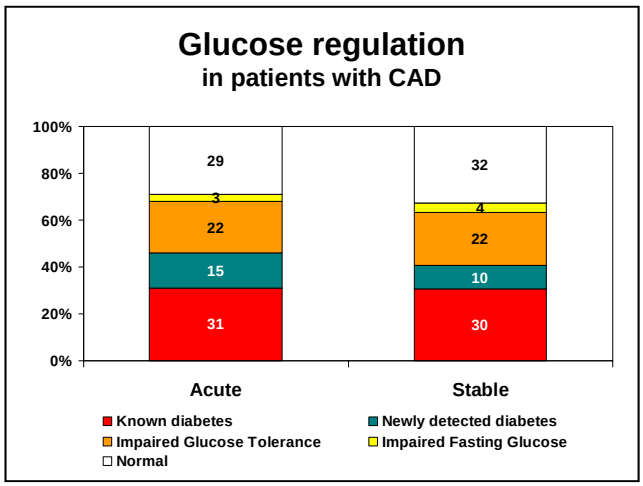


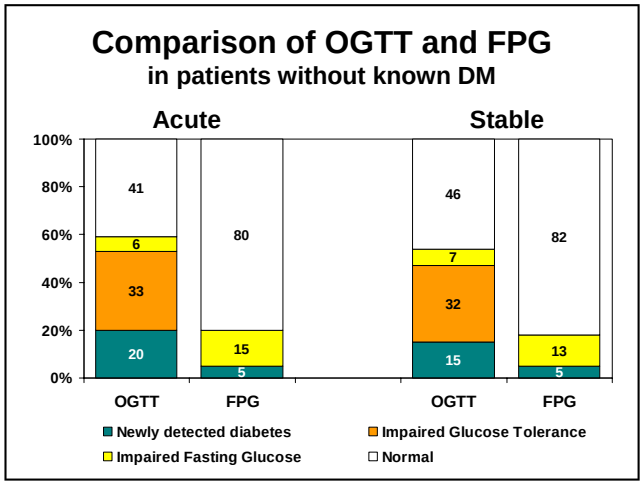




Diabetes & the Heart 2003







The Euro Heart Survey on Diabetes & the Heart (2003) included 4,961 patients from 110 hospitals in 25 countries. Enrolled patients were referred to a cardiologist for coronary artery disease (CAD). 2,107 (43%) were admitted on acute basis, 2,854 (57%) had stable CAD, and most patients had concomitant cardiovascular diseases (CVD). An oral glucose tolerance test (OGTT) was recommended by the protocol and glucometabolic characterisation performed according to WHO recommendations.[59-60]

The survey revealed that diabetes is known to be present in about a third of both acute and stable patients with CAD.[59] When an oral glucose tolerance test was performed, another 15% of acute patients and 10% of stable patients were shown to have diabetes that was not yet recognised. Furthermore, about a quarter had abnormal fasting glucose or impaired glucose tolerance. Thus, the majority of patients with acute or chronic coronary disease have an abnormal glucose metabolism. A coronary event often is the first manifestation of diabetes. The outcome of this survey underlines the importance to include diagnostic testing of glucose abnormalities when investigating patients with CAD. An OGTT is needed for full disclosure of the actual glucometabolic state. One would have missed about two thirds of patients with abnormalities using fasting plasma glucose (FPG) only.[60]

The presence of glucometabolic disturbances should intensify the use of various secondary preventive efforts. In accordance with guidelines for CVD prevention, this survey revealed high prescription rates for anti-

platelets, lipid lowering drugs, beta-blockers, and ACE-inhibitors in comparison with previous surveys. ACE-inhibitors were prescribed more often in patients with previously known diabetes than other patients in this survey.

The survey confirmed that patients with CAD and known diabetes are at high risk for mortality and cardiovascular events and demonstrated that patients with newly diagnosed diabetes are at intermediate risk. Although impaired glucose regulation (IGR) could not be identified as an independent predictor for adverse outcomes at 1-year follow up, it has been shown by several studies that IGR markedly increases the risk of developing diabetes. Interventions aiming at delaying or preventing the onset of diabetes may prove beneficial for patients with IGR.

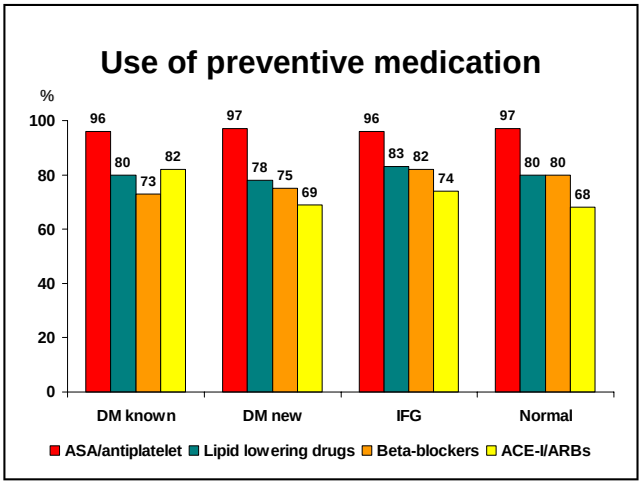
Conclusion:

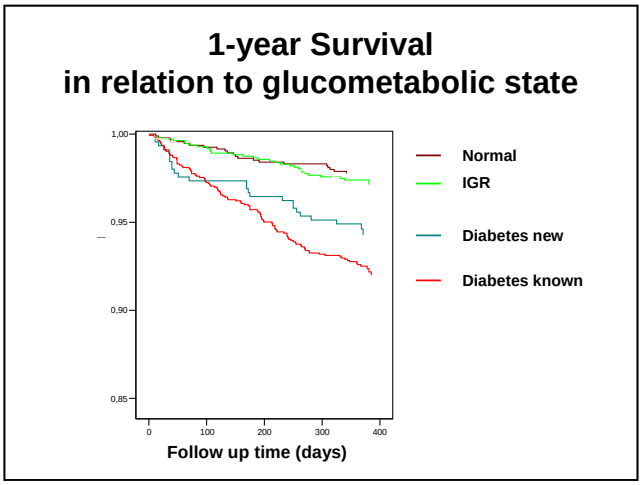
(1) The majority of patients with acute or chronic CAD have an abnormal glucose metabolism;

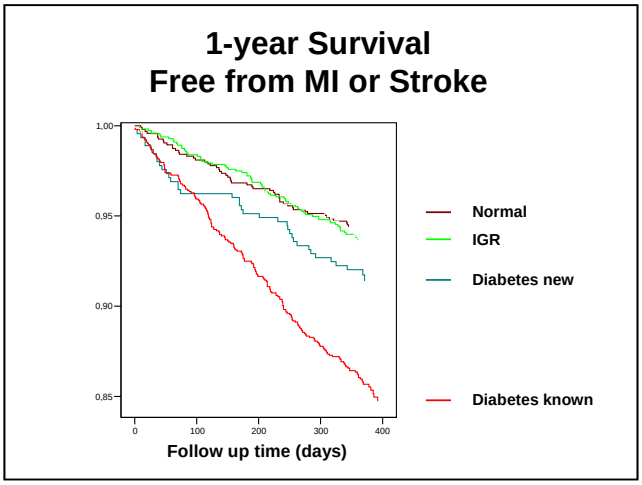
(2) Diagnostic testing of glucose abnormalities when investigating patients with CAD is of utmost importance;

(3) The prescription rate for CVD preventive medication was high compared to previous surveys;

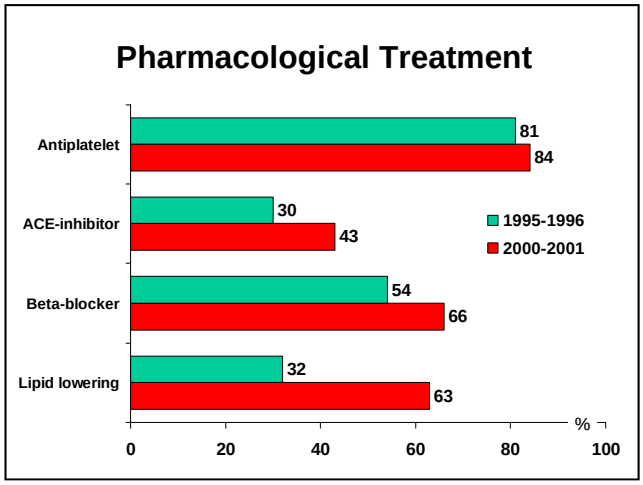
(4) IGR could not be identified as an independent predictor for adverse outcomes within 1 year, but interventions aiming at delaying or preventing the onset of diabetes may prove beneficial for patients with IGR.

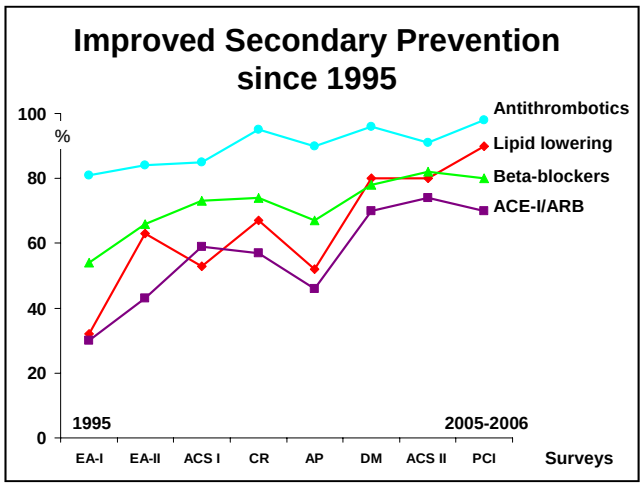


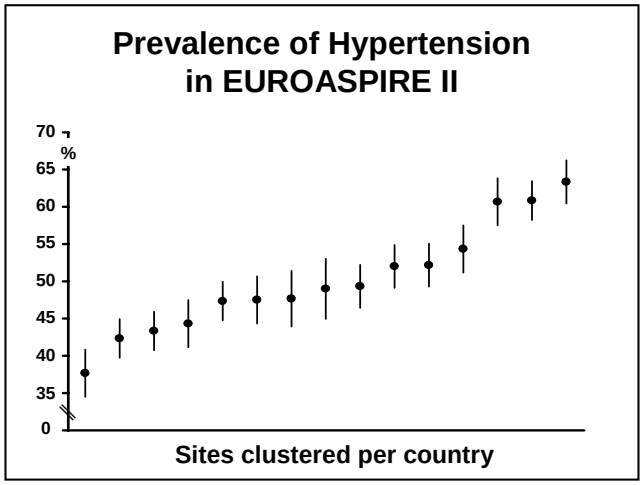




Secondary CHD Prevention 1995-2005







Patients with coronary heart disease (CHD) are defined as the highest priority for preventive cardiology in the recommendations drawn up by the ESC to reduce their risk of further coronary and atherosclerotic events. The first EUROASPIRE survey (EA-I) among consecutive patients with established CHD (≤ 70 years of age) was carried out in nine countries in 1995–1996. The second EUROASPIRE survey (EA-II) took place in 2000-2001. Each survey was undertaken in 21 centres, 20 of which were common to both studies. 4863 hospital medical records were reviewed in EA-I, and 4914 in EA-II; 3569 and 3379 patients were interviewed, respectively, after a median follow up of 1.4 years.[8-18]

More than 80% of the patients in both surveys took aspirin or other antiplatelet drugs.[8] For other recommended drugs for secondary prevention, increased use was seen in every country and each diagnostic category, but there were large variations between countries. Use of beta-blockers increased from 54% in EA-I to 66% in EA-II. The increase in use of ACE inhibitors was from 30% to 43%. The frequency of prescription of lipid-lowering drugs increased from 32% in the first to 63% in the second survey. This positive development in pharmacological treatment to prevent recurrent CHD events further improved throughout the various surveys of the Euro Heart Survey programme.

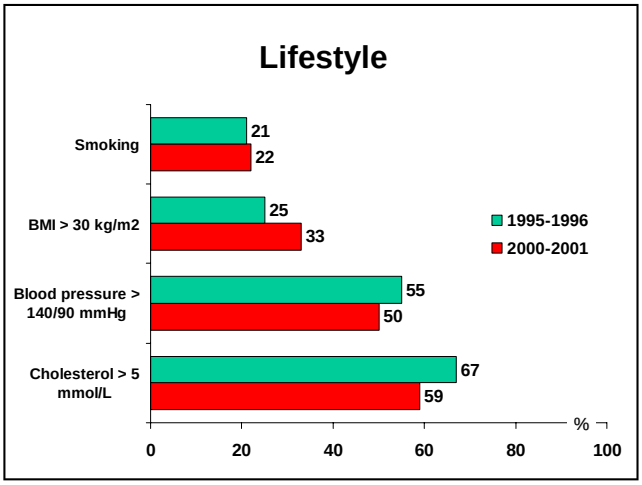
Elevated blood pressure is associated with an increased risk of cardiovascular disease, whereas reduction of elevated blood pressure is associated with improved outcome.[10] Adequate blood pressure control is therefore

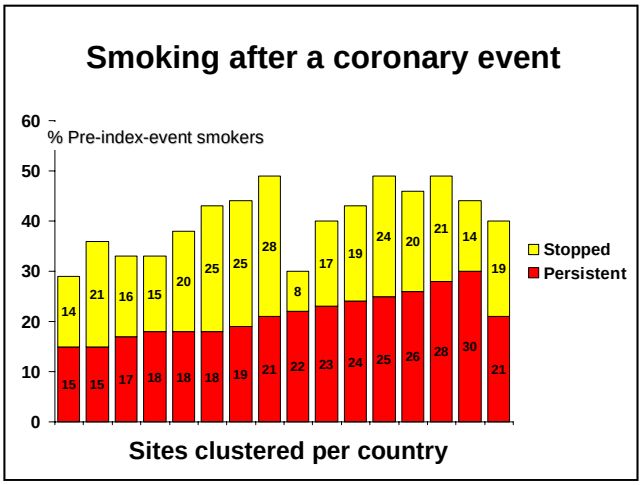
of utmost importance. In EA-II patients, 25% had a diastolic blood pressure ≥ 90 mmHg, and 46% had a systolic blood pressure ≥ 140 mmHg. Isolated systolic hypertension was observed in 26%. Altogether, 50% of patients were classified as having elevated blood pressure during the interview. Large variations were observed between participating centres, with prevalence values ranging from 37% to 64%. During 1995–2000 the prevalence of elevated blood pressure in patients with established CHD remained at an unacceptably high level. Throughout Europe, still about half of coronary patients require more intensive blood pressure management.

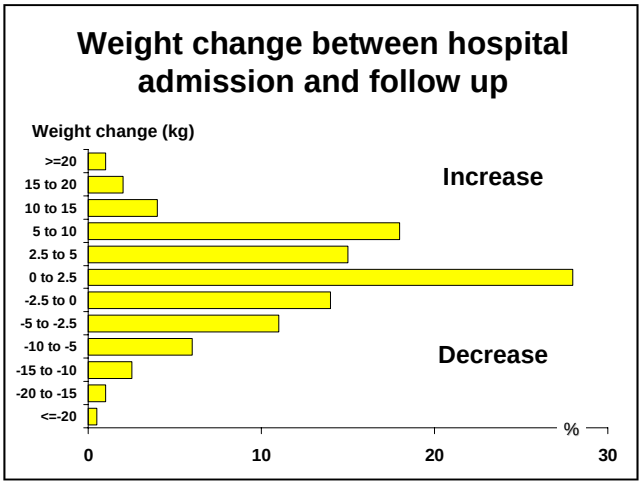
Most patients do not succeed to improve their lifestyle after a coronary event. Half of the patients continue smoking after a coronary event,[18] and in the period between coronary event and interview, body weight had increased with at least five kilograms in a quarter of all patients.[15] Despite improved pharmacological treatment, many CHD patients are still not achieving the cholesterol goal of less than 5 mmol/L and recommended blood pressure levels.

Conclusion:

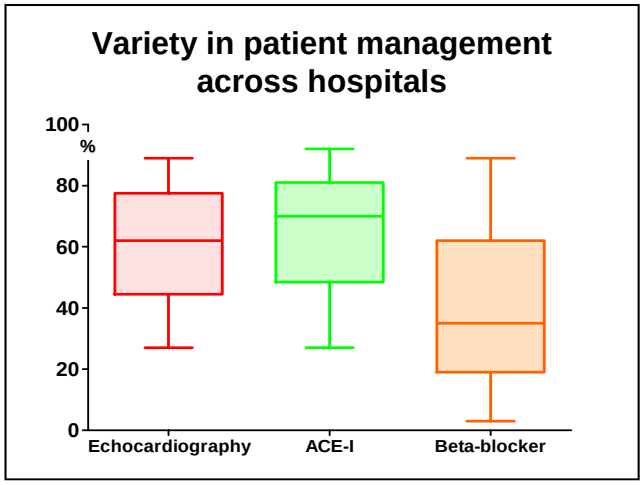
(1) Pharmacological treatment to prevent recurrent CHD events improved since 1995.
(2) The adverse lifestyle trends among European CHD patients are a cause of concern.
(3) Most patients do not succeed to improve lifestyle after a coronary event.
(4) There is still substantial potential to reduce the risk of recurrent disease and death among patients with CHD.

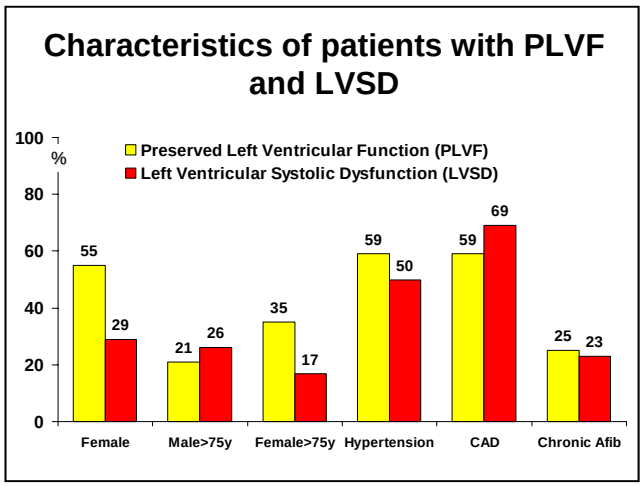


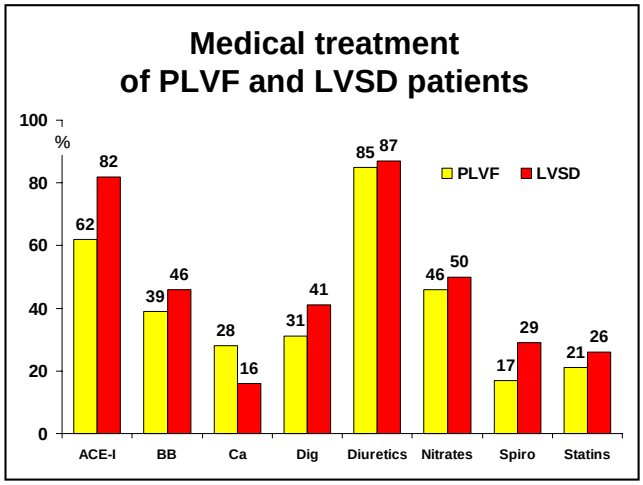




Heart Failure 2000-2001







The Euro Heart Survey on Heart Failure was undertaken during 2000-2001 in 115 hospitals from 24 countries. Of 46,782 consecutive case notes of death or discharges (all causes) from internal medicine, geriatric, cardiology and cardiac surgery wards, 10,701 (24%) were identified with suspected or confirmed heart failure.[19-26]

The majority of patients had had an ECG (95%), chest X-ray (92%), haemoglobin, electrolytes and renal function measured (>90%) as recommended in ESC guidelines.[20] Echocardiography was, however, performed in only 66% of patients, and ranged from 27% to 89% of patients between hospitals. Most (82%) of patients with heart failure due to left ventricular systolic dysfunction (LVSD) received an ACE-inhibitor as recommended by guidelines. However, only 29% received the dose as recommended in clinical trials.[21] Beta-blockers were prescribed in only 46% of LVSD patients, and just 4% received the recommended dose. The application of ACE-inhibitors and beta-blockers varied largely between hospitals.

Although current guidelines are mainly based on clinical trials in LVSD patients, almost half (46%) of the enrolled patients did not have LVSD.[22] Patients with a preserved left ventricular function (PLVF) were older, more often women, and more likely to have hypertension as compared to LVSD patients. PLVF patients received less cardiovascular medication compared to LVSD patients, with the exception of calcium antagonists. No differences in treatment effect on mortality between the two groups was observed, indicating that PLVF patients may also benefit from

medical treatment recommended in LVSD patients.

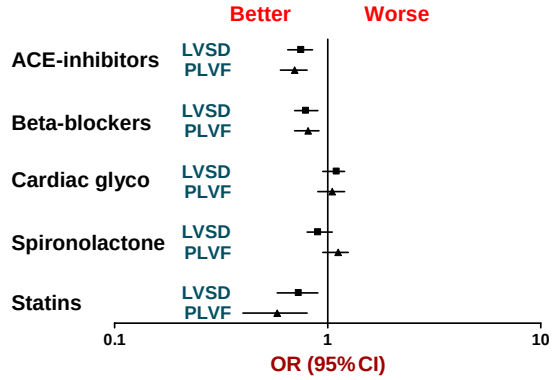
Of all patients enrolled in this survey, only a small percentage (13%) would have qualified for participation in the SOLVD, MERIT or RALES trial.[23] Patients who fulfilled enrolment criteria of these trials were more likely to be treated with ACE-Is (83% of SOLVD-eligible patients), beta-blockers (54% of MERIT-HF-eligible patients), and aldosterone antagonists (43% of RALES-eligible patients) than trial-ineligible patients. Only 6% of MERIT-HF eligible patients who were treated with beta-blockers received the target dose.

The Euro Heart Survey on Heart Failure II was carried out during 2004 and 2005, and the main publication has been submitted.

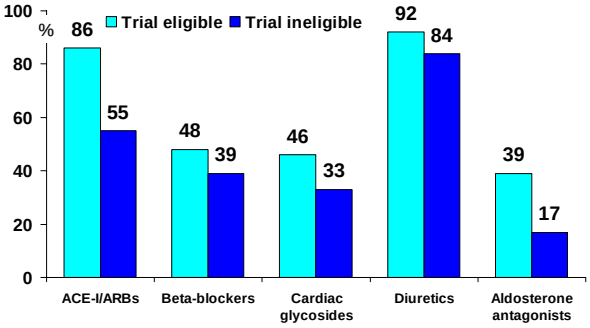
Conclusion:

(1) Many of the recommended basic investigations were done, but echocardiography was performed less frequently than expected.
(2) In accordance with guidelines, the majority of heart failure patients with LVSD received an ACE-inhibitor, but beta-blockers were prescribed in only half of these patients.
(3) Even in trial eligible patients, beta-blockers were prescribed in half of the patients, and the recommended dose was prescribed in a small minority only.
(4) The application of diagnostic and therapeutic procedures varied largely between hospitals.
(5) Guidelines are mainly based on clinical trials in heart failure patients with LVSD, but almost half of the enrolled patients did not have LVSD.

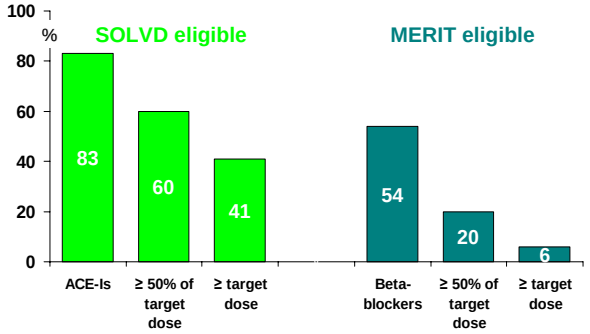
All cause mortality by medical treatment



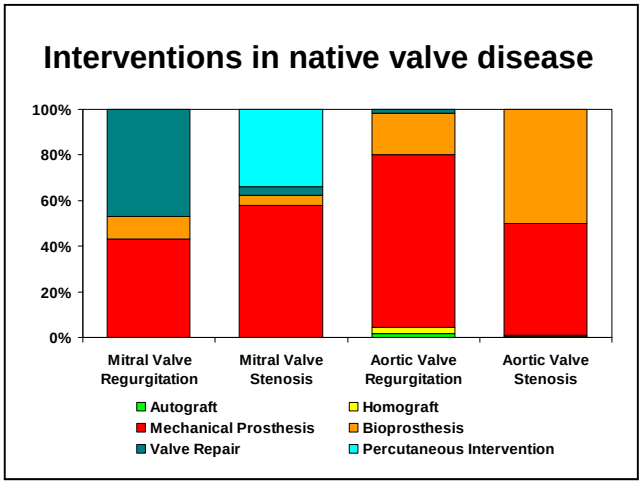
Medical treatment of trial eligible and trial ineligible patients

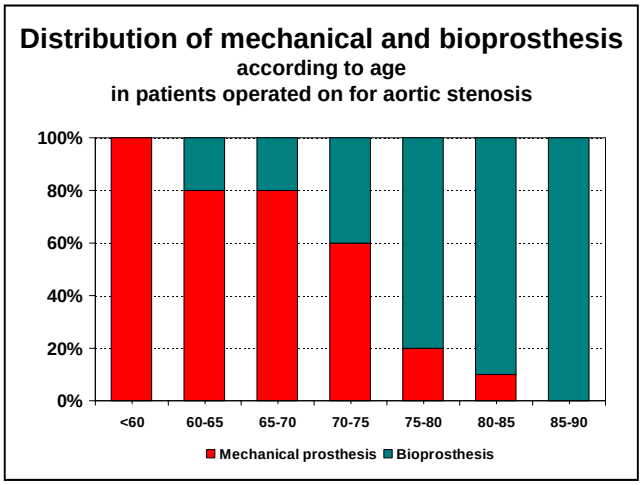


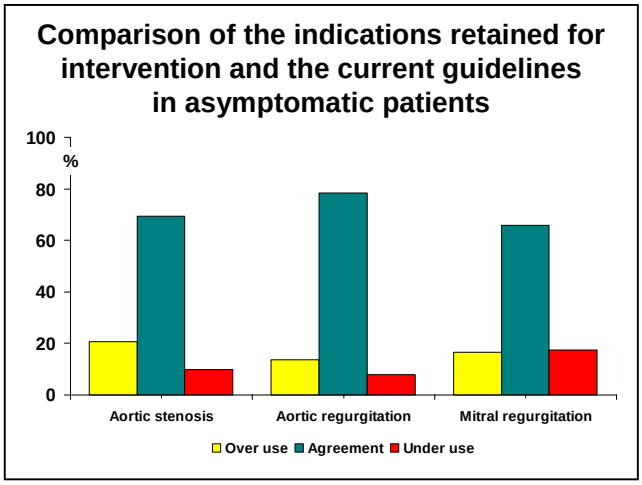
Medical treatment of SOLVD and MERIT eligible patients



Valvular Heart Disease 2001







The Euro Heart Survey on Valvular Heart Disease (VHD) was conducted in 2001. In 92 centres from 25 countries, 5,001 adult patients were included with moderate to severe native VHD, infective endocarditis, or previous valve intervention. Enrolled patients were hospitalised in medical (43%) or surgical (19%) cardiology departments, or visited the outpatient clinic (38%).[47-49]

Aetiology was predominantly degenerative for aortic stenosis and rheumatic for mitral stenosis.[47] Valve repair was the treatment of choice in about half of the patients with mitral regurgitation, while autografts and mechanical prostheses were equally used in aortic stenosis. The application of mechanical prostheses as compared to bioprostheses in patients operated on for aortic stenosis varied largely by age, as appropriate. Mechanical prostheses were predominantly applied in young patients, whereas in elderly patients a bioprosthesis was the preferred treatment.

Overall the indications for interventions in asymptomatic patients were in agreement with guidelines in the majority of patients (66%-79%), and among the different single native valve disease patients. One-third of patients with severe valve disease and severe symptoms were not operated on. The reasons for not advising intervention were either cardiac, extra-cardiac or both. The multifactorial nature of the decision process in such patients and the absence of precise recommendations in the field of VHD explains the wide variability of advice given and make it difficult to make meaningful comparisons with guidelines.

Aortic stenosis (AS) is the most frequent heart valve disease in Western countries, where its prevalence steadily increases with age. Indications for aortic valve replacement are well defined in guidelines and there is a consensus that intervention should be advised in patients with severe, symptomatic AS. Decision to operate raises specific problems in the elderly, because of the increase in operative mortality and morbidity. In this survey, 216 patients aged 75 or older had severe AS (valve area ≤0.6 cm^2/m^2 body surface area or mean gradient ≥50 mmHg) and angina or dyspnoea New York Heart Association class III or IV.[48] A decision not to operate was taken in 72 of these patients (33%). In multivariable analysis, older age and left ventricular dysfunction were the most obvious characteristics of patients who were denied surgery, whereas comorbidity played a less important role. Neurological dysfunction was the only comorbidity significantly related to the decision not to operate.

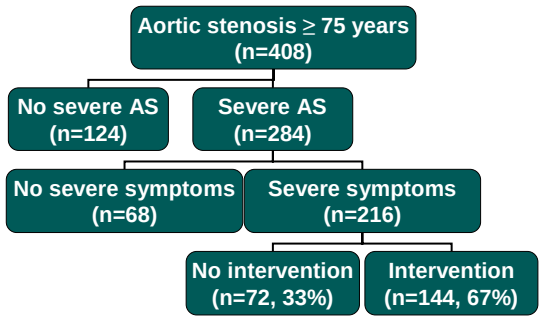
Conclusion:

(1) Mechanical prostheses were predominantly applied in young patients, whereas in elderly patients a bioprosthesis was the preferred treatment, as appropriate.

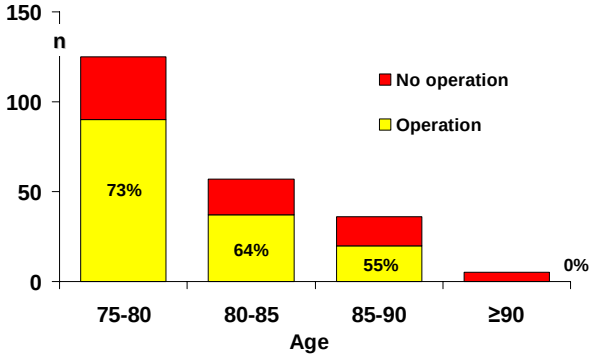
(2) The indications for interventions in the asymptomatic patient were in agreement with guidelines in the majority of patients.

(3) One-third of elderly AS patients with severe symptoms were denied surgery due to cardiac and non cardiac reasons.

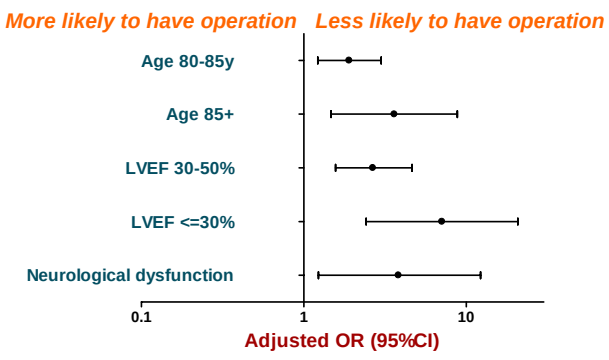
Denial of surgery in elderly with severe symptomatic aortic stenosis



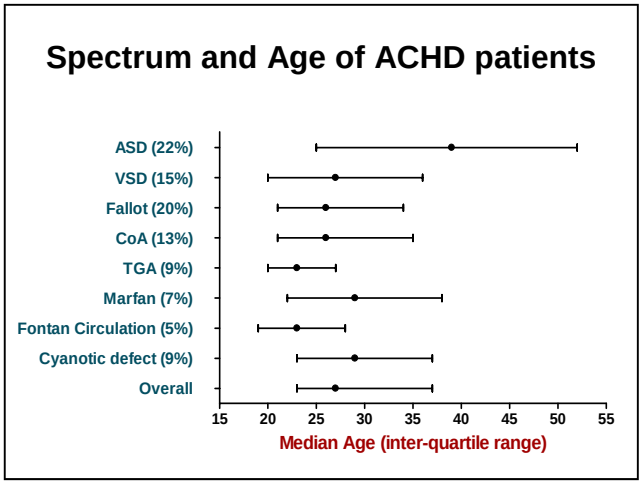
Decision to operate according to age

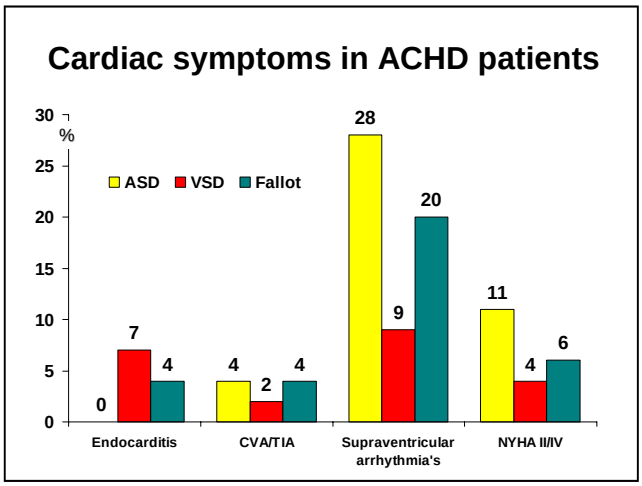


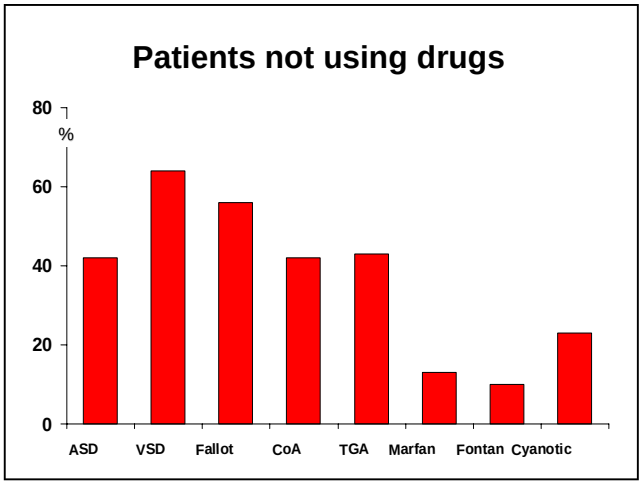
Factors associated with a decision not to operate severe aortic stenosis



Adult Congenital Heart Disease 2003-2004







The Euro Heart Survey on Adult Congenital Heart Disease (ACDH) was conducted in 2003 and 2004. In 79 centres (48 specialised) from 26 countries, 4,168 consecutive patients with ACHD older than 17 years of age visiting the outpatient clinics in 1998 were included retrospectively with a median follow-up of 5.1 years.[61-66]

The survey focused on eight selected defects: Atrial Septal Defect (ASD) (22%), Ventricular Septal Defect (VSD) (15%), Tetralogy of Fallot (20%), Aortic Coarctation (13%), Transposition of Great Arteries (TGA) (9%), Marfan Syndrome (7%), Fontan Circulation (5%), and Cyanotic defect (9%).[61] At baseline, most patients were in their twenties or thirties. The overall median age was 27.9 years and 79% of the patients were aged < 50 years. Median age varied per defect, reflecting the severity of the condition.

The majority of patients had no or only mild functional limitations, but a considerable proportion of the patients had a history of endocarditis, arrhythmias, or vascular events. Overall, supraventricular arrhythmia's had occurred in 18% of patients vs. 5% for ventricular arrhythmia's, 3% were reported to have experienced endocarditis, 4% stroke or transient ischemic attack, and 1% had a previous myocardial infarction or had undergone PCI or CABG. There were important differences between the eight defects, with worst outcomes in cyanotic defects and in the Fontan Circulation. Arrhythmias were the most common symptom, with, for example, supraventricular arrhythmia's in 28% of ASD patients vs. 9% in VSD patients. More than half of the patients were using

chronic medication. Among Fontan, only 10% did not use any drugs. However, even among ASD patients, a significant proportion did use drugs.

A total of 2.8% died during the study period. All-cause mortality was lowest in patients with CoA (0.7%), ASD (1.1%), Tetralogy of Fallot (1.3%), and VSD (1.6%) and highest in those with cyanotic defect (12.6%) or Fontan Circulation (8.2%).

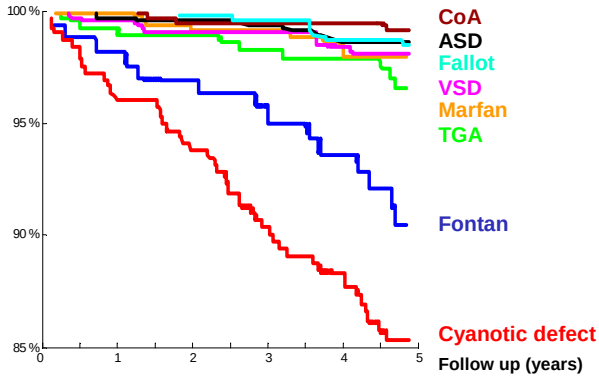
Guidelines showed to be reasonably applied in clinical practice, with variation per type of defect and with a better adherence for operative procedures and prophylactic medication than for diagnostic work-up.[62] For example, according to guidelines, all patients aged 40 years or older should have a coronary angiography (CAG) before undergoing a cardiac operation, while angiography is not indicated in patients younger than 40 years of age. The data showed that in 567 patients operated on during follow up, angiography was under-used in 43% and over-used in 15% of patients.

Conclusion:

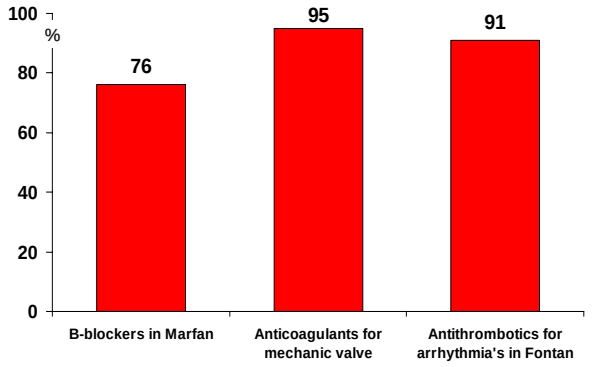
(1) The spectrum of ACHD in Europe emerging from this survey is one of a predominantly young population with substantial morbidity but relatively low mortality in a 5 year period, with important differences between the eight defects studied.

(2) Adherence to guidelines was good for operative procedures and prophylactic drug treatment. There was a gap between clinical practice and guidelines for angiographic work-up in patients older than 40 years.

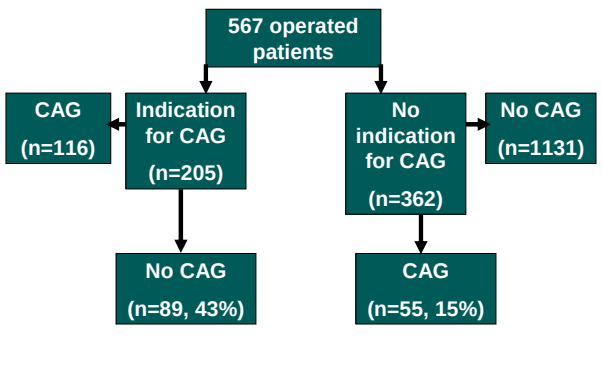
Survival Curves for the Eight Defects



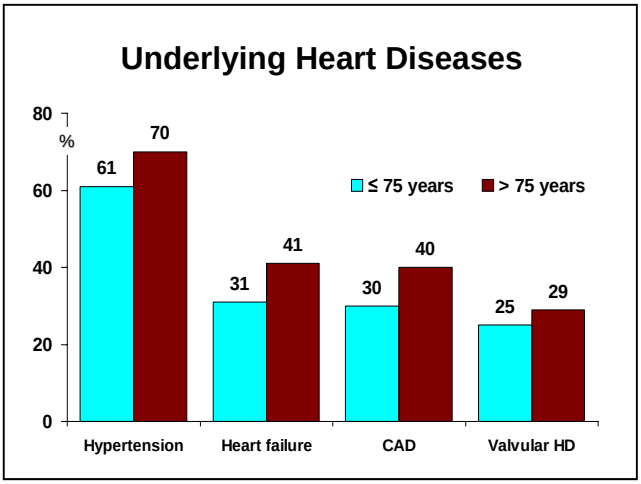
Use of prophylactic medication

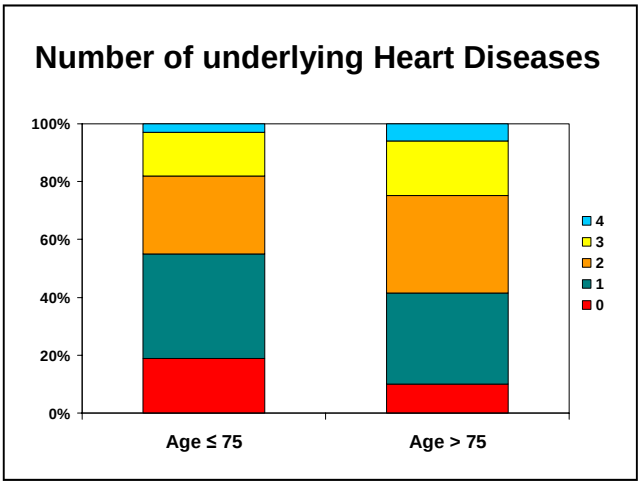


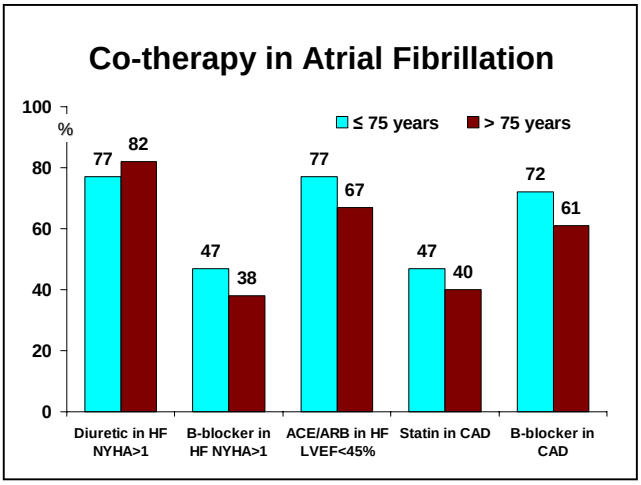
Application of CAG in operated patients



Atrial Fibrillation 2003-2004







The Euro Heart Survey on Atrial Fibrillation (AF) included 5,333 consecutive in– and out-patients from 182 centres in 35 countries (2003-2004). AF was primary or secondary diagnosis, and was confirmed on ECG or Holter in the preceding 12 months. First detected AF was reported in 18% of patients, paroxysmal AF in 28%, persistent AF in 22%, permanent AF in 29%, and in 3% of patients clinical type of AF was unknown.[67-69]

AF is a disorder with high prevalence figures in the elderly. In this survey, mean age was 67 years, and 26% of patients were older than 75 years.[67] Atrial fibrillation is often secondary to coronary artery disease (CAD), heart failure, valvular heart disease (VHD), or hypertension. Especially the elderly often have underlying heart diseases, with, for example, 70% having hypertension, 41% heart failure, 40% CAD, and 29% VHD. Only 10% of the elderly have no underlying heart disease, while a quarter has three or four underlying diseases. AF can, however, also occur as a primary condition. Patients with paroxysmal atrial fibrillation most often have no other cardiovascular disease (20%), while the relatively old group of patients with permanent atrial fibrillation is less often free from other cardiovascular diseases (7%).

Treatment of associated cardiovascular diseases in AF patients can be improved, especially in the elderly. For example, only 38% of elderly AF patients with heart failure received beta-blocker therapy, and statins were prescribed in only 40% of elderly AF patients with CAD.

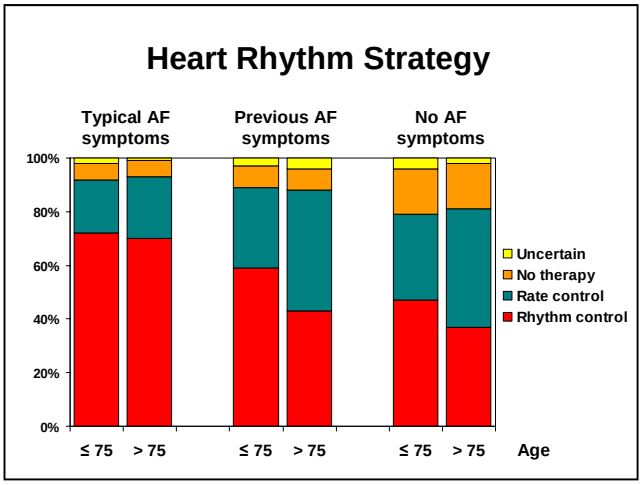
In fair agreement with the guidelines, 67%

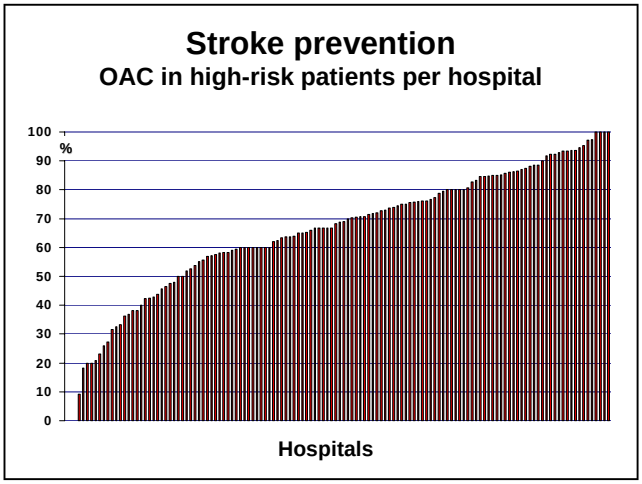
of currently symptomatic patients received a rhythm control strategy. Guidelines state that rhythm control should be applied only in symptomatic patients, but was applied in 44% of patients in this survey who never experienced any symptoms. In these patients, rate control to prevent heart failure would probably be sufficient, and may also help to avoid possible adverse effects of rhythm control.

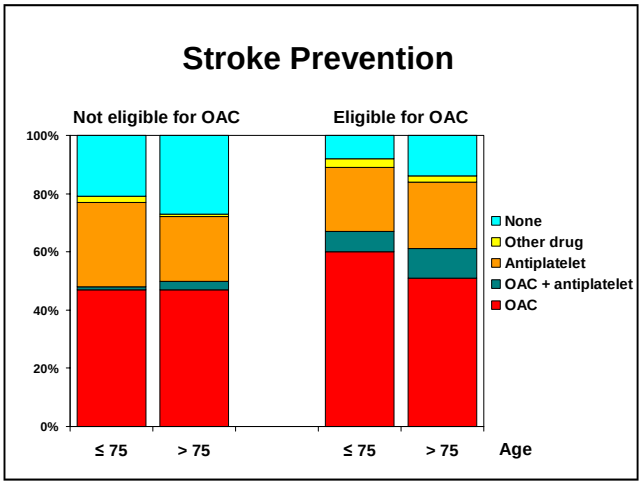
A consequence of the high number of patients with associated cardiovascular diseases is that the vast majority of AF patients is at high risk for stroke (86%). To improve prognosis of AF patients, antithrombotic treatment and management of associated conditions should have a high priority. Yet, the survey revealed that anticoagulation therapy (OAC) in patients with AF varied largely between hospitals. A significant proportion of patients (33%) with an indication for anticoagulation is not treated as such, which was even 40% in the elderly. Remarkably, half of the patients without an indication for anticoagulation did receive anticoagulation therapy.

Conclusion:

(1) Most AF patients have underlying cardiovascular diseases, especially the elderly.
(2) Treatment of associated cardiovascular diseases in AF patients needs a higher priority.
(3) In contrast with guideline recommendations, rhythm control is often applied in asymptomatic AF patients.
(4) Stroke prevention varied largely between hospitals, and is not strongly determined by stroke risk.







Concluding Remarks

The burden of cardiovascular diseases remains high across Europe. Cardiovascular diseases continue to be the main cause of death, and a major cause of morbidity and loss of quality of life. New therapeutic options for prevention and treatment of cardiovascular diseases have resulted in an increasing number of patients who survive a cardiovascular event, and who require subsequent medical or interventional therapy. The burden of cardiovascular disease has shifted from the middle-aged to the elderly, and the prevalence of many cardiovascular diseases increases exponentially with ageing, especially coronary heart disease, heart failure, atrial fibrillation, hypertension and aortic stenosis. This is a challenge for modern cardiology since all surveys show that management of elderly patients often differs from management in younger patients. Specific attention is needed for guideline development and adherence in elderly patients.

To reduce the burden of cardiovascular diseases in Europe, the ESC takes responsibility for the development of guidelines and standards, continuing education, and professional conduct. The Euro Heart Survey Programme monitors to which extent clinical practice corresponds with existing guidelines. These efforts can be summarised as “a cycle of quality improvement” in order to reduce the burden of cardiovascular disease in Europe (page 22).

The Euro Heart Survey programme was developed to achieve three main goals.

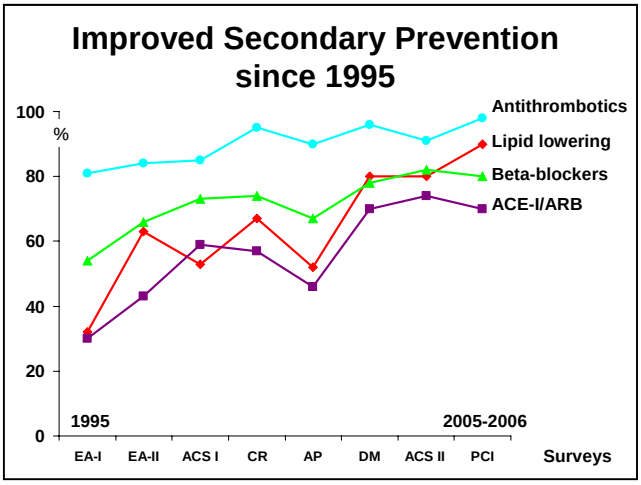
1. To assess the adherence of guidelines for the prevention, diagnosis and management of cardiovascular disease in clinical practice in the ESC member countries.
2. To evaluate to what extent patients who are seen in the daily clinical practice of cardiology and vascular medicine are appropriately represented in clinical trials, which are the main source for guideline development (evidence based medicine).
3. To assess the relation between the adherence to clinical practice guidelines and patient outcome.

The data presented in this report demonstrate that the Euro Heart Survey programme is successful. Surveys have been conducted on secondary prevention of coronary artery disease, heart failure, acute coronary syndromes, coronary revascularisation, PCI, valvular heart disease, stable angina pectoris, atrial fibrillation, diabetes and the heart and adult congenital heart disease, and ACS and PCI surveys have evolved towards continues registries.

The currently available data provide answers to the three questions raised.

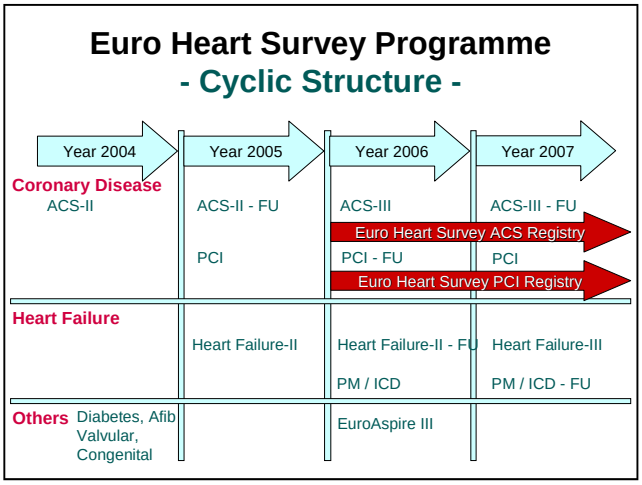
1. There is a wide variation in practice among hospitals in Europe, as well as among hospitals in individual countries. Adherence to guidelines is variable and can be improved. Comparing the results of successive surveys in patients with coronary artery disease it is apparent that chronic treatment (secondary prevention) is improving over the years. Future surveys will continue to monitor and register such improvement in management of coronary artery disease as well as in other fields of cardiology and vascular medicine. Elderly less often undergo diagnostic procedures and less often receive medication to prevent a (recurrent) cardiovascular event. Research, guideline development,

and strategies to improve guideline adherence should provide specific attention to the elderly.



2. Patients seen in routine clinical practice differ significantly from those selected for participation in clinical trials as they are older, more often female, have a more severe cardiac condition and more often suffer from concomitant diseases. Specific studies of diagnostic procedures and therapy are required in these patient groups.
3. Patients managed according to guidelines have overall best patient outcomes. In the coming years, more detailed analysis on this topic will be performed.

Quality assurance in medicine is a continuous process and in the coming years the ESC will extend the survey programme. Consistent questionnaires will be developed based on data standards as agreed on in the CARDS project, procedures for data collection and quality control will be improved, and the programme will be extended to other hospitals throughout Europe. Furthermore, we expect that the Euro Heart Survey Programme will be integrated with national registries and surveys. Hospital information systems will evolve to allow online data collection in clinical practice, for reporting by the responsible physician as well as access to national and international registries survey programmes. Improved online data collection using simplified case report forms will allow continuous registration of specific patient groups and procedures by interested hospitals. Such continuous registries have been developed in different countries, and a PCI registry and an ACS registry have been introduced recently throughout Europe. Continuous registries offer “quality assurance” and “bench marking” to the participating hospitals, which certainly will lead to improved quality of care.



The Euro Heart Survey committee is grateful to all contributors to this report and in particular to the participating hospitals which provide insight into the actual practice of cardiology.

Euro Heart Survey Publications

General

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Account of the Applied Methods

Data sources

The most important data source of this report is the World Health Organisation (WHO) European Health for All database (HFA-DB), and the WHO Mortality database (WHO-MDB). These WHO databases provide access to a wide range of basic health statistics for the 52 Member States of the WHO European Region. It was developed by the WHO Regional Office for Europe (WHO/Europe) in the mid-1980s to support the monitoring of health trends in the Region. The data in this database are mainly submitted by European Member States to the WHO/Europe. New data are continuously collected, and updated versions of the database are made public twice a year. For this report the June 2006 databases are used.

There are various sources from which WHO/Europe regularly collects health data. The largest part of the data is annually collected directly from countries. Secondary information sources, such as other international organizations and agencies, are also an important source of data for a number of indicators. The main secondary data sources used in the regular updating of the WHO database are the following.

- Annual bulletin of housing and building statistics for Europe and North America, United Nations Economic Commission for Europe, Geneva
- Economic survey of Europe, United Nations Economic Commission for Europe, Geneva
- FAO statistical database, Food and Agriculture Organization of the United Nations, Rome
- Human development report, United Nations Development Programme, New York
- OECD health database, Organisation for Economic Co-operation and Development, Paris
- Statistics of road traffic accidents in Europe and North America, United Nations Economic Commission for Europe, Geneva
- Tobacco journal international
- UNESCO statistical yearbook, United Nations Educational, Scientific and Cultural Organization, Paris
- United Nations, Population Division, New York
- World Bank atlas, World Bank, Washington, DC
- World drink trends, Commodity Board, Distilled Spirits Industry, Netherlands
- Yearbook of labour statistics, International Labour Organization Geneva

Data quality

WHO data are compiled, validated and processed in a uniform way in order to improve the international comparability of statistics. Nevertheless, since health data recording and handling systems and practices vary between countries, so do the availability and accuracy of data reported to WHO. Data comparability is also limited, owing to differences in definitions and/or time periods, incomplete registration in some countries or other national specificities in data recording and processing. International comparisons between countries and their interpretation should thus always be made with caution. The data for mortality-related indicators are probably the most complete and comparable, although in some countries (mainly those in central and eastern Europe and particularly the countries of the former USSR) the coding of underlying causes of death may contain

some peculiarities. In addition, a few countries are not able to ensure complete registration of all births and deaths. This problem can be further aggravated by a lack of sufficiently accurate population estimates used as the denominator when calculating indicators. These problems mainly affect data during the 1990s, and are caused by severe socio-economic difficulties and armed conflicts in some countries. The following regions are most affected: the central Asian republics (particularly Tajikistan), the Caucasus countries (particularly Georgia), some countries in the Balkans region (particularly Albania and Bosnia and Herzegovina).

Country grouping

Averages for country groupings, including the European Region average and the other regional averages, are population-weighted averages. They are calculated when a minimum of 50% of the countries have data for a given indicator for a selected period. The number of countries included in the average calculations for different indicators will therefore vary. To ensure that a time-series includes the same countries throughout, data are checked by country and year and missing values are estimated. Linear interpolation is used to calculate the missing values between years.

Standardisation procedures

In view of the large heterogeneity in age across countries, standardisation is needed for comparisons of health indicators between countries. Age-standardised death rates are calculated using the direct method, i.e. they represent what the crude rate would have been if the population had the same age distribution as the European standard population, as follows.

Age group (years)	European standard population
0	1600
1–4	6400
5–9	7000
10–14	7000
15–19	7000
20–24	7000
25–29	7000
30–34	7000
35–39	7000
40–44	7000
45–49	7000
50–54	7000
55–59	6000
60–64	5000
65–69	4000
70–74	3000
75–79	2000
80–84	1000
85 +	1000
Total	100000

Maps

The maps were prepared with the latest version of MAPLAND Spreadsheet Mapping software. For better presentation the maps in this report cover only part of the whole area of countries belonging to the ESC or the WHO European Region. The borders of the maps sometimes slice territories of countries. This presentation was chosen in order to let the visual image of differences between countries be dominated by countries with data available on most indicators.

Definitions & Abbreviations

WHO European Region
The 52 countries of the World Health Organisation (WHO) European Region: Albania, Andorra, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Malta, Monaco, Netherlands, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, San Marino, Serbia and Montenegro, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, TFYR Macedonia, Turkey, Turkmenistan, Ukraine, United Kingdom, Uzbekistan.

European Union (EU)
The 25 Member States of the European Union: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

EU-15
The 15 Member States of the European Union prior to 1 May 2004: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom.

EU-10
The 10 Member States which joined the European Union from 1 May 2004: Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia.

Commonwealth of Independent States (CIS)
The 12 countries of the Commonwealth of Independent States, which are 12 out of 15 countries of the former USSR: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, Uzbekistan.

Central Asian Republics (CARK)
Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, and Kazakhstan.

Cardiovascular Diseases (CVD)
ICD9 001-E999 or ICD10: I00-I99.

Ischemic Heart Disease (IHD)
ICD-9: 410-414 or ICD-10: I20-I25.

Cerebrovascular Disease / Stroke
ICD-9: 430-438 or ICD-10: I60-I69.

% of regular daily smokers in the population, age 15+
This indicator is measured using a standardised health interview of a representative sample of the population aged 15 years and above. Many countries are carrying out such health interview surveys on a more or less regular basis. However, most of the data are collected from multiple sources by the Tobacco or Health unit at WHO/EURO.

Health Expenditure as PPP€ per capita
A Purchasing Power Parity (PPP) exchange rate equalises the purchasing power of different currencies in their home countries for a given basket of goods. These special exchange rates are often used to compare the standards of living between countries. The adjustments are meant to give a better picture than comparing GDP using market exchange rates. This type of adjustment to an exchange rate is, however, controversial because of the difficulties of finding comparable baskets of goods to compare purchasing power across countries.
For OECD Member States, the data are taken from the OECD Health Database (Organisation for Economic Co-operation and Development). For non-OECD countries, the data are as reported by the country to the HFA-DB. The OECD definition of total expenditure on health is applied and it includes: household health expenses, including goods and services purchased at the consumer's own initiative and the cost-sharing part of publicly financed or supplied care; government-supplied health services including those in schools, prisons and armed forces and special public health programmes such as vaccination; investment in clinics, laboratories etc.; administration costs; research and development, excluding outlays by pharmaceutical firms; industrial medicine; outlays of voluntary and benevolent institutions. In the case of most central and eastern European countries the following has to be included: direct state budget allocated to the health sector, state subsidies to the mandatory health insurance system; mandatory health insurance contributions by employers and employees; direct health expenditure of employers for running industrial medical facilities; direct health expenditures of ministries and governmental agencies; charity health expenditures; foreign assistance; outstanding debt at the end of the year; private health insurance and direct private health charges.

Health Expenditure as % of GDP
Gross Domestic Product (GDP) per capita is often used as an indicator of the standard of living in an economy. The GDP is defined as the market value of all final goods and services produced within a country in a given period of time.
For OECD Member States, the data are taken from the OECD Health Database. For non-OECD countries, the data are as reported by the country to the HFA-DB. The OECD definition of total expenditure on health is applied (see definition of Health Expenditure as PPP€ per capita).

Number of cardiologists
Members of National Societies associated with the ESC.

Definitions & Abbreviations

Physicians per 1000

A physician is a person who has completed studies in medicine at the university level. To be legally licensed for the independent practice of medicine (comprising prevention, diagnosis, treatment and rehabilitation), (s) he must in most cases undergo additional postgraduate training in a hospital (from 6 months to 1 year or more). The number of physicians at the end of the year includes all active physicians working in health services (public or private), including health services under other ministries than the Ministry of Health. Interns and residents, i.e. physicians in postgraduate training, are also included. The number of physicians excludes: physicians working outside the country; physicians on the retired list and not practising or unemployed; physicians working outside health services, e.g. employed in industry, research institutes etc.; dentists (stomatologists) who should be defined as a separate group.

Nurses per 1000

A nurse is a person who has completed a programme of basic nursing education and is qualified and authorized in his/her country to practise nursing in all settings for the promotion of health, prevention of illness, care of the sick and rehabilitation. Basic nursing education is a formally recognized programme of study (normally at least 2 years or more, including university level) which provides a broad and sound foundation for the practice of nursing and for post- basic education which develops specific competency. The number of nurses at the end of the calendar year includes only active nurses, i.e. those working in hospitals, primary health care, nursing homes, etc. The number of nurses includes: qualified nurses, first- and second-level nurses, feldschers (physician's assistants - a category of health personnel present in some eastern European countries), midwives, and nurse specialists. It excludes: nursing auxiliaries (without formal education in nursing), and other personnel without formal education in nursing.

Length of hospital stay

Length of stay (LOS) of one patient = date of discharge - date of admission. If these are the same dates, then LOS is set to one day.

Hospital beds

A hospital bed is a regularly maintained and staffed bed for the accommodation and full-time care of a succession of inpatients and is situated in wards or areas of the hospital where continuous medical care for inpatients is provided. It is a measure of hospital capacity. The number of hospital beds is measured in available beds at mid-year (preferably) or end-year. Hospital beds excludes: cots for neonates, day beds, provisional and temporary beds, beds in storerooms, beds for special purposes or belonging to special health devices, e.g. dialysis, delivery.

Abbreviations

ACS	Acute Coronary Syndrome
ACE-I	Angiotensine converting enzyme inhibitor
ACHD	Adult Congenital Heart Disease
AF	Atrial Fibrillation
AP	Angina Pectoris
AS	Aortic Stenosis
ASD	Atrial Septal Defect
BB	Beta-Blocker
BMI	Body Mass Index
CABG	Coronary Artery Bypass Grafting
CAD	Coronary Artery Disease
CAG	Coronary Angiography
CARDS	Cardiology Audit and Registration Data Standards
CME	Continuing Medical Education
CHD	Coronary Heart Disease
CVD	Cardiovascular Disease
Ca	Calcium antagonist
CoA	Aortic Coarctation
CR	Coronary Revascularisation
COPD	Chronic Obstructive Pulmonary Disease
DES	Drug Eluting Stent
DM	Diabetes Mellitus
Dig	Digitalis
EA	EUROASPIRE
ECG	Electrocardiogram
EHS	Euro Heart Survey
ESC	European Society of Cardiology
FPG	Fasting Plasma Glucose
HDL	High density lipoprotein cholesterol
HFA-DB	WHO European Health for All Database
HR	Hazard Ratio
IABP	Intra-aortic balloon pump
IGR	Impaired Glucose Regulation
IHD	Ischemic Heart Disease
LDL	Low density lipoprotein cholesterol
LVEF	Left Ventricular Ejection Fraction
LVSD	Left Ventricular Systolic Dysfunction
MI	Myocardial infarction
NSTEMI	Non ST elevation myocardial infarction
NYHA	New York Heart Association
OAC	Oral anticoagulation
OADR	Old Age Dependency Ratio
OECD	Organisation for Economic Co-operation and Development
OGTT	Oral Glucose Tolerance Test
OR	Odds Ratio
PAD	Peripheral Arterial Disease
PCI	Percutaneous Coronary Intervention
PLVF	Preserved Left Ventricular Function
PVD	Peripheral Vascular Disease
RCT	Randomised Controlled Trial
Spiro	Spironolactone
STEMI	ST elevation myocardial infarction
TC	Total cholesterol
TG	Triglycerides
TGA	Transposition of the Great Arteries
UA	Unstable Angina
VHD	Valvular Heart Disease
VSD	Ventricular Septal Defect

Data Summary

Countries	Population * million	% 65+	Live births per 1000	Life Expec-tancy at birth	Life Expec-tancy at 65 yr	CVD Mortality Men per 1000	CVD Mortality Women per 1000	Absolute number of CVD deaths
Albania	3.13	7.87	15.15	75.77	16.00	5.25	3.69	8994
Andorra	0.07	.	11.52	.	.	.	.	.
Armenia	3.21	10.08	11.15	73.08	14.18	7.51	5.36	14253
Austria	8.17	16.26	9.50	79.70	19.03	2.87	2.03	32636
Azerbaijan	8.36	6.69	13.78	72.42	15.12	7.31	5.41	26505
Belarus	9.82	14.39	9.05	68.97	14.12	9.67	4.95	76807
Belgium	10.41	16.25	10.81	77.55	17.61	3.12	1.97	37952
Bosnia and Herzegovina	3.91	6.29	9.14	72.73	14.96	5.85	4.88	14797
Bulgaria	7.78	17.12	8.98	72.60	14.87	8.41	5.60	74064
Croatia	4.44	16.64	9.08	75.66	16.05	4.98	3.56	24959
Cyprus	0.74	11.93	11.27	79.54	18.10	2.98	1.93	2018
Czech Republic	10.21	13.99	9.57	75.96	16.21	5.31	3.57	55042
Denmark	5.40	14.82	11.92	77.30	17.07	3.21	1.95	20873
Estonia	1.35	16.62	10.66	72.89	16.13	6.92	3.77	9231
Finland	5.23	15.72	11.05	78.99	18.99	3.35	1.82	19758
France	60.26	16.24	12.74	79.55	19.56	2.10	1.23	158095
Georgia	4.37	14.15	10.67	76.09	17.48	6.30	4.83	28376
Germany	82.50	18.31	8.55	79.36	18.69	3.15	2.19	368472
Greece	11.10	17.98	9.55	79.05	18.10	3.43	2.84	51150
Hungary	10.11	15.43	9.34	72.59	15.32	6.48	4.10	69050
Iceland	0.29	11.72	14.47	81.18	19.63	2.81	1.48	732
Ireland	4.04	11.15	15.46	77.21	16.91	3.54	2.13	11652
Israel	6.81	9.91	21.67	79.73	18.69	2.10	1.46	11296
Italy	58.03	18.86	9.44	80.09	19.15	2.80	1.84	235289
Kazakhstan	15.01	7.63	18.19	66.21	13.39	10.70	6.66	77860
Kyrgyzstan	4.93	5.49	19.92	67.33	13.87	8.42	5.97	16196
Latvia	2.31	16.36	8.80	71.26	15.45	7.92	4.44	17896
Lithuania	3.44	15.06	8.85	72.10	16.22	6.93	4.17	22531
Luxembourg	0.45	14.18	12.03	79.56	19.00	2.91	1.89	1373
Malta	0.40	13.17	9.69	79.43	17.95	2.94	2.22	1255
Monaco	0.03	.	9.46	.	.	.	.	248
Netherlands	16.28	13.94	11.92	79.42	18.37	2.53	1.56	44638
Norway	4.60	14.76	12.37	79.71	18.73	2.73	1.69	16623
Poland	38.56	13.05	9.33	74.99	16.62	5.10	3.14	168674
Portugal	10.50	16.91	10.41	77.50	17.61	2.99	2.21	41035
Republic of Moldova	3.60	9.86	10.62	68.58	13.06	9.65	7.01	23555
Romania	21.67	14.53	9.98	71.88	14.94	7.62	5.58	159253
Russian Federation	143.82	13.55	10.45	65.41	13.69	11.26	6.39	1287726
San Marino	0.03	16.18	10.80	82.28	21.30	2.53	1.47	80
Serbia and Montenegro	10.51	16.47	10.72	72.68	14.36	6.48	5.29	59460
Slovakia	5.40	11.46	9.45	73.91	15.43	6.60	4.32	27995
Slovenia	2.00	15.17	8.91	77.32	17.63	3.54	2.23	7111
Spain	42.65	16.83	10.65	80.46	19.65	2.11	1.41	123867
Sweden	8.99	17.18	11.07	80.09	18.69	3.08	1.92	42381
Switzerland	7.39	15.76	9.89	80.77	19.76	2.38	1.53	23738
Tajikistan	6.43	3.98	27.07	72.01	15.00	7.11	5.13	11758
TFYR Macedonia	2.03	10.69	13.33	73.54	14.44	6.82	5.30	10184
Turkey	71.15	4.21	20.92	68.70	.	.	.	.
Turkmenistan	4.98	3.83	21.08	66.10	13.82	10.17	7.17	14098
Ukraine	47.27	15.74	9.04	67.71	13.93	10.63	6.46	473746
United Kingdom	59.48	16.01	11.97	79.04	18.38	2.80	1.77	216891
Uzbekistan	25.86	4.42	20.89	71.27	14.74	7.88	6.08	71139
European Region	879.53	13.68	12.81	75.06	16.99	5.08	3.38	4313312
EU	458.01	16.47	10.43	78.64	18.42	3.20	2.08	1786865
EU-15	383.50	17.01	10.63	79.43	18.83	2.74	1.80	1406062
EU-10	74.51	13.69	9.36	74.55	16.28	5.59	3.49	380803
CIS	277.68	11.97	12.41	67.23	13.96	10.33	6.26	2122019

Latest available WHO data ≈ 2004; * ESC data on membership of National Societies

Countries	CVD Hospital discharge per 1000	Number of Hospital Beds per 1000	Number of Physicians per 1000	Number of Nurses per 1000	Number of Cardiologists *	Health Expenditure as % of GDP	Health Expenditure as PPP€ per Capita
Albania	6.65	3.01	1.18	3.56	101	6.6	318.46
Andorra	7.29	2.76	3.20	2.90	·	7.1	2009.67
Armenia	8.33	4.44	3.27	4.06	88	5.6	249.94
Austria	40.09	8.34	3.45	6.01	982	7.5	1841.48
Azerbaijan	5.41	8.27	3.61	7.23	·	3.7	124.58
Belarus	53.09	10.71	4.61	11.74	50	6.3	576.19
Belgium	20.71	6.79	4.48	13.41	472	9.3	2275.19
Bosnia and Herzegovina	8.61	2.97	1.40	4.32	117	9.3	279.53
Bulgaria	29.11	6.13	3.52	3.83	302	7.7	494.44
Croatia	17.98	5.53	2.50	5.14	348	7.9	698.44
Cyprus	8.20	4.28	2.61	4.26	106	6.2	756.84
Czech Republic	36.35	8.47	3.48	8.53	655	7.2	1037.93
Denmark	24.13	3.99	2.95	7.02	1006	9.0	2209.78
Estonia	33.87	5.82	3.16	6.51	211	5.5	604.22
Finland	36.70	6.90	3.19	7.63	729	7.5	1771.41
France	22.18	7.60	3.38	7.26	2297	10.0	2348.38
Georgia	6.35	4.07	4.89	3.43	173	4.0	150.28
Germany	32.37	8.58	3.39	7.68	5595	10.9	2376.41
Greece	21.96	4.71	4.38	2.55	1892	9.8	1639.82
Hungary	42.88	7.83	3.34	8.62	1984	8.4	1038.71
Iceland	17.97	7.51	3.61	9.24	42	10.8	2731.47
Ireland	14.38	3.48	2.76	18.81	42	7.2	2039.26
Israel	20.55	6.11	3.65	5.99	237	8.7	1535.48
Italy	25.52	4.12	6.19	2.96	7836	8.7	1887.42
Kazakhstan	17.85	7.77	3.65	6.33	·	3.9	306.01
Kyrgyzstan	10.04	5.29	2.62	6.25	·	5.4	137.82
Latvia	33.99	7.74	3.11	5.30	311	6.4	584.76
Lithuania	44.83	8.43	3.90	7.46	158	6.5	635.37
Luxembourg	24.33	6.77	2.76	9.46	45	6.9	3108.33
Malta	8.35	4.64	3.24	5.09	·	9.2	1312.79
Monaco	·	19.57	6.64	16.21	·	9.9	3735.14
Netherlands	15.49	4.58	3.15	14.00	1159	9.8	2379.52
Norway	24.77	4.29	3.46	14.76	694	9.9	3007.11
Poland	28.44	5.47	2.29	4.75	3421	6.4	630.70
Portugal	12.48	3.64	3.29	4.19	737	9.8	1481.75
Republic of Moldova	20.32	6.41	3.08	7.04	51	7.5	157.29
Romania	28.82	6.55	1.98	4.01	861	5.7	440.71
Russian Federation	32.67	9.88	4.22	7.99	188	5.3	444.60
San Marino	·	7.16	2.52	5.08	42	7.8	2469.85
Serbia and Montenegro	14.63	5.99	2.68	6.03	777	10.1	335.59
Slovakia	25.56	6.99	3.12	6.62	278	5.8	645.49
Slovenia	17.45	4.80	2.26	7.18	161	8.7	1370.41
Spain	14.13	3.69	3.22	3.67	3016	7.8	1485.65
Sweden	24.81	5.22	3.26	10.17	1303	9.5	2238.59
Switzerland	18.00	5.88	3.75	8.30	464	11.6	3078.74
Tajikistan	7.67	6.31	2.02	4.47	·	4.5	63.85
TFYR Macedonia	12.67	4.94	2.19	5.19	100	7.0	320.02
Turkey	11.53	2.64	1.39	2.48	1125	7.7	458.62
Turkmenistan	13.85	4.90	2.62	4.68	·	3.8	174.42
Ukraine	32.80	8.73	3.01	7.77	92	5.8	281.09
United Kingdom	14.52	3.98	2.13	4.99	1378	8.1	1970.74
Uzbekistan	12.69	5.26	2.74	9.94	·	5.4	131.59
European Region	26.26	6.91	3.52	6.70	41626	7.57	1254.73
EU	24.24	5.91	3.47	7.31	35774	8.87	1850.31
EU-15	22.78	5.84	3.61	7.25	28489	9.27	2059.57
EU-10	30.09	6.50	2.78	6.18	7285	6.8	766.66
CIS	27.77	8.67	3.72	7.85	·	5.27	345.42

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