Bulletin of the World Health Organization, **66** (1): 7–14 (1988)
© World Health Organization 1988

Prevention of cardiovascular disease among the elderly*

M. J. KARVONEN[1]

Cardiovascular diseases are a major cause of mortality, morbidity and disability of the elderly in both developed and developing countries. Their prevention has two aims: to add life to years and years to life. Observational studies suggest that the risk factors for these diseases in the middle-aged predict their incidence and the mortality due to them among the elderly. Direct evidence on the effectiveness of prevention by controlling these risk factors in the elderly, however, is still largely lacking or inconclusive. Nevertheless, the recent falling mortality trends in several countries indicate that deaths due to cardiovascular diseases can decrease rapidly also among the elderly, although the causes of the trends are not yet all clear. The very large cross-national differences in mortality from coronary heart disease and cerebrovascular diseases are a challenge for the wider application of preventive measures now. For the control of some risk factors, particularly of high blood pressure, further research focused on the elderly is urgently needed.

INTRODUCTION

Research on the prevention of cardiovascular diseases (CVD), which has been expanding for more than thirty years, was started on account of the epidemic of coronary heart disease (CHD) that was spreading over the affluent nations. The stated goal of this research was to prevent premature loss of life and disability, special attention being given to middle-aged males, who were the most affected. The discipline of preventive cardiology, which grew from these early efforts, now rests on a broad scientific foundation and CVD prevention programmes have been able to change national mortality statistics in a dramatic way (*1*).

The middle-aged are, however, no longer the only target population because preventive measures are now being applied to whole communities, including the elderly. The latter are in many ways a special population in view of their demographic situation and social problems. Physiological changes and reduced functional capacities in the aging organism, as well as the higher frequency of illnesses and their natural history in this age group, should be taken into consideration in planning prevention programmes. Carefully monitored feasibility studies will be needed to learn how to prevent effectively, and for policy decisions the cost of such programmes must also be known.

* A French translation of this article will appear in a later issue of the *Bulletin*.

[1] Professor, I-84060 Pioppi SA, Italy. Formerly Director, Institute of Occupational Health, Helsinki, Finland

Years to life or life to years?

Current changes in the age structure of populations everywhere are rapidly increasing the proportions of the elderly and the very old. Deaths are mainly due to accidents and diseases until the ages of 50–60 years, after which the processes of biological aging become an increasingly important determinant of the quality of life and death. The rate of biological aging is believed to be largely programmed by the genes. Adverse exposures and life-styles may accelerate the process of aging, but whether lives may be prolonged well beyond the present limits is not known.

At present, many persons aged 65 still have more years ahead of them. For example, in Canada 72.3% of men and 85.1% of women in 1978 survived till 65 and still had a mean life expectancy of 14.4 and 18.7 years, respectively, to look forward to. However, less is known about the quality of life than of life expectancy. Essential to the independence of the individual is whether he or she can perform, without aid, the necessary daily activities. Simple standard methods exist for measuring the various degrees of disability between autonomy and total dependence in carrying out the activities of daily life. For Canadians at age 65, it was estimated that more than half the remaining years to come would be free of disabilities. The expectancy of long-term institutionalization for the entire population at birth was 0.8 years for males and 1.5 years for females, a large part of this occurring after the age of 65 (*2*).

Prevention of dependence and prolonging the "active life expectancy" of the elderly are worthy

objectives for both the individual and the community. WHO's focus on health for all by the year 2000 includes the target of adding life to years and promoting health capabilities. If prevention of CVD would result in postponement of loss of autonomy, the gain in terms of human life would be considerable. On the economics side, the terminal year of life is the most costly one for the health services, and this cost item is not likely to change much owing to increased longevity. The latter would, however, influence the total costs depending on the degree of autonomy of the elderly before the terminal year (*3*).

Mortality and state of health as guides

Preventive measures should be addressed to those who need them. Cardiovascular diseases are leading causes of death among the elderly of the industrialized countries, coronary heart disease, cerebrovascular diseases and pulmonary heart disease being the main groups. The elderly often suffer from several illnesses and die with multiple diagnoses. Among Whites in the USA the total frequency of heart disease in death certificates exceeded by 40%, and of strokes by 60%, their frequencies as the underlying causes of death which are the basis of mortality statistics (*3*). Accidental deaths should not be forgotten: falls are a frequently recorded underlying cause of death among the elderly, with often a mention of cardiovascular disease.

Deaths due to cardiovascular diseases are not uniformly distributed. Males have higher age-standardized mortality than females. Wide international differences are observed; in several countries CVD mortality has in recent years been decreasing, but there are also countries with increasing trends. The proportions of deaths due to coronary heart disease and cerebrovascular disease vary largely between nations. Both in international comparisons and time trends of CVD mortality, the patterns for the elderly are very similar to those for the middle-aged in their countries (*1*).

Clinical research on cardiovascular diseases in the elderly keeps providing a wealth of data on patients, but morbidity statistics cover only limited populations and are poorly standardized for cross-national comparisons. There is no firm indication that country differences or time trends in CVD mortality would at present be reflected in the actual patient load of the health services.

As congestive heart failure, angina pectoris and intermittent claudication limit physical activity and obstructive disease of the leg arteries often leads to amputations, some 10% of the elderly are likely to be severely restricted in mobility and 2–8% in developed countries are being treated in institutions. However, the contribution of cardiovascular diseases to the dependence of the elderly is poorly known (*4, 5*).

Autonomy of the elderly depends more on functional capacities than on medical diagnoses. A wide range of methods for measuring functional capacities of the elderly are available. For the study of active life expectancy and of possibilities to extend it, comparative studies of functional capacities in contrasting populations would be of great value.

RISK FACTORS

Force of risk factors in the elderly

The concept of risk factors (i.e., those determining the occurrence of illness) has largely emerged from studies of coronary heart disease. Atherosclerosis is a long process and leads to various manifestations. Risk factors such as diet, blood pressure and smoking exert their influence mostly over several decades. It is pertinent to ask which are more important: the early or the recent risk factor levels? A few prospective studies have followed their cohorts for long enough to show that some risk factors recorded at entry remain significant predictors for decades. However, it should also be noted that some risk factors may "track", e.g., those with high blood pressure at entry are likely to have high blood pressure also later.

The predicting force of risk factors may decline during the follow-up of a cohort as a result of selective attrition: those most susceptible to a risk factor die first and the remaining population, on average, consists of the more resistant ones.

With advancing age the incidence of cardiovascular disease increases. It is important to note that risks can be compared in two ways: as risk ratios (relative risks) or as population excess rates (absolute excess risks). While the risk ratios of mortality from coronary heart disease as related to the major risk factors tend to decline with age, the absolute excess rates, i.e., lives lost, on the contrary, increase until the advanced age brackets.

Spectrum of risk factors

Age. The strongest risk factor for coronary heart disease and stroke in apparently healthy people is age. Calendar age is a measure of the duration of cumulative life-long exposures to other risk factors. Moreover, it serves as a convenient approximation of biological age which in the elderly, with senescence, becomes an increasingly important determinant of survival. The force of age as a risk factor seems to be stronger in populations with a high CVD incidence (*6*).

Diet. The role of diet as a determinant of the risk for

CVD has mainly been studied ecologically, by comparing the diets of populations over a wide age range. Dietary fats have emerged as potent determinants of mortality: saturated fats have been associated with increased and mono-unsaturated fats with decreased mortality from all causes, from coronary heart disease and from cancer. When cohort differences in the ratio of mono-unsaturated to saturated fatty acids were used in the prediction equation, 44% of the variance in the 15-year death rate due to CHD of middle-aged and elderly men of fifteen cohorts from seven countries were accounted for; by adding age, blood pressure, serum cholesterol and smoking as predictors, the variance accounted for rose to 96% for CHD, 66% for stroke, 55% for cancer deaths, and 85% for deaths from all causes (*7*). At least in the populations concerned, the amount and type of dietary fat were a major correlate of marked differences in mortality.

Several other dietary constituents are of interest. The linoleic acid content of some serum lipids has been shown to predict the incidence of coronary heart disease in individuals even independently of the level of plasma total cholesterol (*8*). The N-3 polyunsaturated fatty acids (present in great amounts in fish, some vegetable proteins, and fibre) may contribute to anti-atherogenic diets. A vegetarian diet, low salt intake and possibly anti-atherogenic dietary fats may prove effective in controlling blood pressure, a low salt intake also in preventing impairment of glucose tolerance. A high dietary potassium intake has been associated with lower blood pressure and a decrease in the risk of stroke-associated mortality (*9*).

Descriptive surveys on diets of the elderly have been made, but in studies on diet as a CVD risk factor the elderly have not been specially considered.

Plasma lipoproteins, cholesterol and triglycerides. The plasma lipoproteins are centrally involved in the atherosclerotic process. Plasma total cholesterol has been widely studied: it generally increases up to the age of approximately 60 and then starts to decline in males, while in females a rise may continue. In a study in the USA of men aged 80 years and older, a falling trend was still observed. High-density-lipoprotein (HDL) cholesterol and plasma triglycerides did not vary significantly with age. At this high age range, subsequent mortality was predicted by both total and low-density-lipoprotein (LDL) cholesterol, but was not associated with HDL-cholesterol or plasma triglycerides (*10*). For total and LDL-cholesterol as risk factors the results were in accord with those obtained in younger males.

A "protective" association of HDL-cholesterol with incidence of hard-criteria CHD (i.e., myocardial infarctions and coronary deaths) or mortality from CHD has been irregularly observed in studies which have included elderly cohorts. It remains to be explored whether the HDL_2-fraction, to which the main carrier function of the "protective" association has been ascribed, might still be a determinant in the elderly.

The mean total cholesterol of a population appears to be a valuable indicator of diet-induced risk for coronary heart disease over a wide range, including the elderly. Individual cholesterol level seems to be useful also for screening high-risk elderly individuals. However, the predictive value of HDL-cholesterol is limited by the opposite health effects of its major correlates, physical activity and alcohol intake.

Blood pressure. High blood pressure is the most frequently diagnosed and most often treated risk factor for CVD in elderly individuals. The mean systolic pressure of almost every population rises with age. Diastolic pressure also rises moderately in the middle-aged but, on average, decreases in the elderly. The pulse pressure (the difference between systolic and diastolic pressures) thus increases progressively with age, reflecting the decreasing compliance of the aorta and the large arteries. High diastolic pressure is due to increased resistance in the precapillary arterioles. The standard limits for hypertension are $\geqslant$160 mmHg (21.3 kPa) and/or 95 mmHg (12.7 kPa), and for mild hypertension $\geqslant$140 mmHg (18.7 kPa) and/or 90 mmHg (12.0 kPa), both independent of age. Hypertension, so defined, is more often due to a high diastolic pressure in the young and middle-aged, but in the elderly to a high systolic pressure. For increased diagnostic accuracy of hypertension in the elderly, the cases are divided into isolated systolic hypertension and hypertension with a rise of diastolic pressure; the two forms are likely to have different pathogeneses.

As many as 40–60% of those aged 65–74 years in several populations are labelled as hypertensive and 50–85% have at least mild hypertension. Of all hypertension in the world the great majority is mild hypertension of the elderly.

High blood pressure is a health hazard in several senses: it causes hypertensive disease of the target organs (heart and retina), is associated with kidney disease, and is a major contributor to atherosclerosis and its manifestations. It increases mortality from CVD and from all causes, and is responsible for much severe disability among the elderly with strokes.

In the planning of prevention programmes for the elderly, several questions should be taken into consideration, such as:

—the quantitative relations of systolic and diastolic pressures to morbidity and mortality, as modified by sex, age, ethnic origin, and other risk factors;
—the reversibility of the risk by preventive measures, particularly by antihypertensive medication;

—the balance between the favourable and unfavourable effects of preventive measures.

Among the middle-aged, the risk for mortality from CVD increases linearly over the entire range of blood pressures, particularly the systolic pressure. With advancing age, blood pressure loses its role as a predictor of mortality in some but not all populations. Above the age of 85 years even a reversed prediction has been observed, a lower systolic pressure being associated with higher all-causes mortality. J- and U-formed relationships between blood pressure and mortality have also been described in the elderly.[a] The risk for strokes rises with blood pressure in both sexes at all ages.

Large controlled trials have been organized for establishing the effect of hypotensive drug treatment on blood pressure, CHD incidence and mortality. In a recently concluded trial, such treatment reduced mortality from all CVD by 38%, from heart disease by 47%, and from cerebrovascular disease by 43%. The treatment effects decreased with advancing age, and in patients over the age of 80 years were minimal if any (*11*). Lowering the diastolic pressure of the elderly below 95 mmHg (12.7 kPa) has not brought any benefit, and lowering to below 85 mmHg (11.3 kPa) has been associated with increased mortality in elderly patients who had evidence of ischaemic heart disease (*12*). In multifactorial trials the benefit from the treatment of hypertension has proved to be less than that from changing the diet and smoking habits, at any age (*13*). No controlled trials on isolated systolic hypertension have been conducted. Subjective well-being has not been systematically observed in any of the major trials. The side-effects of hypotensive drugs and the cost of long-term treatment have also to be weighed against the benefits.

In spite of massive efforts, the pharmacological management of high blood pressure in the elderly remains a complicated issue; non-pharmacological control measures applied to the total population would be an attractive solution. A downward shift in the blood pressure distribution of the population by 2–3 mmHg is likely to produce a reduction in CVD equal to that of treatment of all patients with a diastolic pressure of 105 mmHg (14.0 kPa) or higher (*14*). In fact, hypertension and strokes had decreased as causes of deaths in many countries over a period of decades, even before any effective hypotensive drugs had been introduced; this was probably due to lifestyle changes that are difficult to identify retrospectively. However, recent research has led to promising means for community prevention of hypertension, such as reductions in salt and alcohol consumption and through physical activity.

Smoking. The risk associated with smoking is high both in those apparently healthy and in those with manifest cardiovascular disease. At the age of 65–74 years the relative risk for CVD among current cigarette smokers has been found to be up to double that among non-smokers, as is the case in younger adults. The absolute excess risk is markedly higher in the elderly than in the middle-aged.

When elderly persons give up smoking, a frequent motive may be perceived ill health; this is revealed by the increased mortality among recent quitters. Nevertheless, giving up smoking has reduced the incidence of strokes by more than half (*15*). Massive evidence on the hazards of smoking to the elderly and on the benefits of giving up smoking led to resolutions of the WHO governing bodies on this matter.

Physical activity. The elderly in many populations are living far below their potential capacities owing to inadequate physical fitness. A sedentary life-style does not activate or sufficiently stimulate the organism; this leads to loss of functional capacities and atrophic changes. Many of these changes resemble those associated with aging. Physical activity, in contrast, is able to prevent and correct many of these untoward changes in the locomotive, respiratory, metabolic and neurohormonal systems. Physical fitness can make old persons functionally younger, greatly improve their quality of life, and help them retain their independence.

While the basic processes involved in aging cannot be reversed by physical fitness alone, some advantage in longevity has been found in many studies to be associated with a history of physical activity at work and/or in leisure time. Much of this advantage seems to be ascribable to a lower incidence of coronary heart disease and is independent of the other major risk factors. Physical activity in the elderly has also been associated with a longer life expectancy, although in this age group sedentary habits may be due to limitations imposed by disease.

The elderly, like younger people, respond to an adequate exercise programme with functionally favourable changes. One is never too old to start. Those at high risk or with manifest coronary heart disease should not participate in exercises that might cause myocardial hypoxia or exhaustion. Some of the benefits that physical activity promises to the elderly are increased functional capacity, continued mobility, enhanced psychological status, less obesity and diabetes mellitus, less hypertension and coronary heart disease, and less osteoporosis.

Alcohol. High alcohol consumption is a major risk factor for hypertension, and reduced drinking has

[a] A J- or U-formed relationship between a risk factor and illness occurrence indicates an increased risk with both low and high values of the risk factor, with an optimum zone in between; the term "quadratic" relationship is also used, because quadratic equations are needed for its mathematical description.

been shown to lower the blood pressure. High alcohol consumption has also been established as a risk factor for strokes, independently of their pathogenetic type. However, alcohol is associated with coronary heart disease in two ways: (1) the national per capita consumption of alcohol shows a marked negative correlation with male death rates from CHD, and thus appears as a protective factor; (2) in studies at the individual level, the risk appears best described by a J- or U-shaped curve, with both lifetime teetotallers and heavy drinkers having an increased risk. An explanation for this "protective" effect of moderate use of alcohol against coronary heart disease has been sought for in the increase of high-density lipoproteins due to alcohol, but detailed studies on HDL subfractions have not supported the hypothesis (*16*).

With advancing age, the elderly in many communities tend to reduce their alcohol consumption. Nevertheless, in some population-based studies the role of alcohol as a risk factor for strokes and its U-shaped relationship with mortality from CHD have been confirmed also in the elderly. Heavy drinking is a health hazard to the cardiovascular system as it is to other organ systems.

Diabetes mellitus, glucose tolerance and insulin. Good population-based prospective studies on the role of diabetes as a risk factor for cardiovascular disease are relatively few. In the Framingham study, the age-adjusted risk of diabetics to die from CVD was 2.1-fold in men and 4.9-fold in women. The risk ratios of incidence were also higher in females than males, and decreased in the following order: peripheral artery disease–congestive heart failure–cerebral infarction–coronary heart disease; the largest absolute excess risk, however, applied to coronary heart disease in males (*17*). The role of diabetes as an independent risk factor for coronary heart disease and strokes has been confirmed in some later studies. However, any impact on the occurrence of cardiovascular disease by the treatment of diabetes has never been adequately demonstrated.

The milder form of change in glucose metabolism (impaired glucose tolerance) is in most populations associated with aging, obesity, and a sedentary life-style. It may or may not lead to diabetes. Although high blood glucose has predicted coronary heart disease in some cohorts, impaired glucose tolerance does not appear to be a strong determinant of cardiovascular disease. High plasma insulin has been established as an independent determinant of the incidence of coronary heart disease. High insulin levels are also associated with a sedentary life-style and obesity.

The prevalence of diabetes and of impaired glucose tolerance is rather high among the elderly in some populations. Epidemiological research has used a variety of methods and criteria so that the results are poorly comparable. Antiatherogenic diet, weight control and regular physical activity appear to have key roles in the management of diabetes in the elderly also.

Obesity. Obesity is often included among the major risk factors for cardiovascular disease, but the evidence on this is controversial. In cohort studies obesity is often associated with other risk factors, such as blood pressure and plasma total cholesterol, and predicts CVD in bivariate analyses, but tends to lose predicting force to other risk factors in multivariate analyses. In some populations the relation is even reversed: low body weight for height appears as an independent predictor of mortality from coronary heart disease. Such results are probably linked with the observation made in some studies that obese hypertensives are less at risk than thin ones.

In fact, obese hypertensives have the advantage that when losing weight, the blood pressure falls and stays lower, and the blood lipids change in favourable directions, but the changes in lipids may return after the weight has stabilized at the lower level. Controlled intervention studies on any benefit to be gained through weight loss in terms of CVD incidence and mortality are still lacking.

In the elderly, particularly in the very old, body weight often tends to decrease. This occurs during normal senescence, but may be accelerated by illness. Low weight for height predicts higher all-causes mortality in the elderly, and the association is most marked in those with lowest body weights for height.

Marked obesity is obviously a handicap for an elderly person. Diet and physical activity (when feasible) are recommendable physiological methods for weight control in the elderly also. However, a factual basis for defining desirable weights for health in the elderly is still lacking. Weight reduction by strict limitation of food intake should be undertaken with caution in them.

Physical and chemical risks in the environment. Severe cold and heat impose stresses on the cardiovascular system of the elderly. Seasonal variation of both coronary and cerebrovascular mortality show peaks during extremes of both cold and heat. Blood pressure rises during the cold season, and acute exposures to cold are known to precipitate anginal attacks, ischaemic electrocardiographic changes and arrhythmias. The elderly and patients with cardiovascular disease are particularly sensitive to cold weather, when they prefer to stay indoors and remain sedentary. For prevention, warm housing and clothing are required and also heated premises for physical activity when this is not advisable outdoors. However, adequately heated housing does not by itself abolish the seasonal variation in mortality.

Among chemical exposures that are harmful to the elderly, air pollution by smog is of major importance, the mortality being particularly high among elderly persons with pre-existing chronic cardiopulmonary disease. Another recognized hazard is carbon monoxide emitted, for example, by defective heating installations.

Psychosocial risks. Research on the psychosocial determinants of cardiovascular disease in the middle-aged has been concerned with a wide range of variables: marital status, occupation and social class, education, behaviour pattern, life-style, life changes and other stressful situations, social support, and social networks. Gerontological research, on the other hand, has identified certain psychological and social variables as determinants of longevity, such as high intelligence, work satisfaction and happiness.

Causation works both ways between physical and mental health. The two major problems in the mental health of the elderly are depression and cognitive decline leading to dementia. Depression of the elderly has a multiple etiology to which CVD also contributes. Hypertension in the aged is associated with a decline in intelligence scores. Multiple brain infarctions are a frequent cause of dementia. It might be expected that energetic intervention with treatment of hypertension and other preventive measures could retard the development of this form of dementia. Research in this field is needed.

PREVENTION PROGRAMMES

How much can be achieved by prevention?

Estimates of the gains in health as a result of prevention can be based on four sources: prevention trials, observational studies of the occurrence of illness and its determinants, time trends in mortality, and cross-population differences in disease incidence or mortality.

The most direct evidence comes from prevention trials among the middle-aged, which showed that prevention works. The decrease in incidence of and mortality from coronary heart disease has been most closely associated with a reduction in plasma total cholesterol (*13*). According to the pooled evidence, a decrease by 1% of plasma cholesterol is likely to be associated with a 2% fall in CHD incidence and mortality (*18*).

Observational cohort studies of middle-aged males have identified some predictors of cardiovascular disease in individuals. Several of them are mutually independent and potentially controllable, and have been confirmed in many studies. Their major contributions to different disease entities seem to vary in the following pattern:

- coronary heart disease: plasma total cholesterol — blood pressure — smoking — lack of physical activity;
- peripheral artery disease: smoking — diabetes — cholesterol — blood pressure;
- cerebrovascular disease: blood pressure—smoking — alcohol;
- pulmonary heart disease: smoking.

The same factors generally also aggravate the clinical progress of these diseases. Less firm evidence is available on risk factors in females and the elderly. These risk factors probably also contribute to cardiovascular disease in the developing countries, but little is known about their relative importance there.

Since no population-based controlled intervention trials on the prevention of cardiovascular disease in the elderly have been conducted and the results of cohort studies are seldom available in such a form that the potential of prevention among the elderly could be assessed, time trends in mortality have to serve as a rough guide. Recent ten-year trends in age-standardized CVD mortality in industrialized countries vary from a maximum rise of 33% to a maximum fall of 36% in males and from a rise of 13% to a fall of 42% in females. The rises and falls have little relation to the starting level. In each country, the trends of the five-year age groups run parallel on a logarithmic scale, which indicates that the relative changes over time are similar in all age groups and that, in terms of the numbers of deaths, the greatest changes are occurring among the elderly. What kind of interplay of causative factors lies behind the trends and their differences remains a challenge for epidemiological study. An illuminating conclusion is that the changes, planned or unplanned, in human communities may markedly decrease or increase the CVD mortality of the population, including the elderly, within as short a time as ten years (*1*).

Cross-national population differences in CVD mortality are wide. Table 1 contrasts recent death rates of the elderly in three industrialized countries: Hungary with high, Netherlands with middle-range, and Japan with low mortality from all causes (*19*). In the age range of 65–74 years the death rates from ischaemic heart diseases of males in Hungary were five times and of females 4.5 times those in Japan. Mortality from cerebrovascular disease was lowest in the Netherlands; the ratio of the highest to the lowest among the three nations is for males 3.1 and for females 3.6. More informative is the number of human lives to be saved: for coronary heart disease the difference between the extremes would result in (1279−256=) 1023 males and correspondingly in 499 females per 100 000 population per year, and for cerebrovascular diseases in 660 males and 488 females. Such a reduction would bring the all-causes

Table 1. Death rates per 100 000 population of the elderly in three selected countries in 1981 from all causes, from ischaemic heart diseases, and from cerebrovascular diseases[a]

Sex and causes of death	Age group (years)	Hungary	Netherlands	Japan
Males:				
All causes	65–74	5795	4042	3174
	⩾75	14 160	11 356	10 214
Ischaemic heart diseases	65–74	1279	1111	256
	⩾75	2748	2425	785
Cerebrovascular diseases	65–74	972	312	699
	⩾75	2732	1335	2822
Females:				
All causes	65–74	3355	1837	1757
	⩾75	11 091	7680	7835
Ischaemic heart diseases	65–74	640	441	141
	⩾75	2157	1497	605
Cerebrovascular diseases	65–74	696	208	441
	⩾75	2487	1217	2188

[a] Source, *World health statistics annual 1983* Geneva, World Health Organization, 1983

death rate of Hungarian males aged 65–74 years to 4111 and of females to 2368 per 100 000, and thus greatly level off the country differences in all-causes mortality. The scope for prevention of cardiovascular diseases in the elderly is indeed wide, and greatly exceeds the range of recent time trends of mortality in any country.

The three goals of prevention are reductions in mortality, morbidity and disability. Demographic evidence clearly indicates that with less CVD, life expectancy increases. The assumption that with a reduction in the CVD death rate, cancer and other diseases would automatically replace it, has already been proved erroneous. In fact, cancer and cardiovascular diseases share one major risk factor—cigarettes—and possibly some others also.

Ample data are available on mortality, but few on the quality of life. With increasing longevity, morbidity may only be postponed, perhaps even increased owing to the frailty of the aged. In their last years of life, many elderly persons become disabled and dependent; they may be confined to institutions and life loses much of its quality. This applies particularly to survivors of stroke episodes. In Canada from 1951 to 1978 the total life expectancy of males rose by 4.5 years and of females by 7.5 years. The expectancy of disability-free life increased much less, in males by 1.3 years and in females by 1.4 years only (*2*). This is a disquieting finding: it seems that the years gained in longevity are more likely to prolong the disabilities than a disability-free life. However, pilot studies have given encouraging results: disability and dependence may be reduced by retaining functional capacities through physical, mental and social activities.

Strategies of prevention

A programme for preventing cardiovascular diseases in the elderly needs little planning and modest resources, if it can be made a part of an established programme of community prevention and control of cardiovascular diseases. Much-needed data can be extrapolated from the experiences gained with the middle-aged. Nevertheless, a programme has not only to define the objectives and place targets, but also to find resources and allocate tasks (*20*). The three major resources are the health and social services, the elderly themselves, and the community at large.

The elderly are at high risk for cardiovascular diseases and many of them are already frequent clients of the health and social services. It is up to the health services to upgrade and extend their preventive activities in risk identification, control of hypertension and diabetes, care of CVD, dietary advice and individual health education. Often close cooperation between the health and social services is needed. At all levels of the health and social services a very serious question should be asked: are we at present treating our elderly clients as underprivileged citizens?

The elderly themselves are a potential resource of prime importance for their personal health, and can also promote health in the community. In matters concerning a prudent diet, exercise, weight control and smoking habits they should be given information and advice, but the right to decide belongs to them. For social contacts and physical activity they may need suitable facilities which the community could provide.

In the community at large the prevailing opinions in regard to life-style and health are decisive. Massive efforts by the citizens and their organizations, the media, and the health professions are necessary, but the major responsibility for the healthy life-style of a nation rests with the government. The latter has not only to formulate national policies but also the power and means to guide the nation with legislation, financial allocations, and the provision of facilities, based on a national policy for health that takes care of the special needs of the elderly also. Discrimination against and negative attitudes to the elderly should be eliminated, and the economic and political barriers to a healthy life-style and full participation in the social framework should be removed.

REFERENCES

1. UEMURA, K. & PISA, Z. Recent trends in cardiovascular disease mortality in 27 industrialized countries. *World health statistics quarterly*, **38**: 142–162 (1985).
2. WILKINS, R. & ADAMS, O. *Healthfulness of life. A unified view of mortality, institutionalization and non-institutionalized disability in Canada, 1978*. Montreal, The Institute for Research on Public Policy, 1983.
3. MANTON, K. G. & SOLDO, B. J. Dynamics of health changes in the oldest old: new perspectives and evidence. *Milbank Memorial Fund quarterly· Health and society*, **63**: 206–285 (1985).
4. SVANBORG, A. ET AL. *Epidemiological studies on social and medical conditions of the elderly. Report on a survey*. Copenhagen, WHO Regional Office for Europe, 1982 (EURO Reports and Studies 62), pp. 11–16.
5. STRASSER, T., ed. *Cardiovascular care of the elderly*. Geneva, World Health Organization, 1987, pp. 18–19.
6. MARIOTTI, S. ET AL. Age, period, cohort and geographical area effects on the relationship between risk factors and coronary heart disease mortality: 15-year follow-up of the European cohorts of the Seven Countries Study. *Journal of chronic diseases*, **39**: 229–242 (1986).
7. KEYS, A. ET AL. The diet and 15-year death rate in the Seven Countries Study. *American journal of epidemiology*, **124**: 903–915 (1986)
8. VÁLEK, J. ET AL. Serum linoleic acid and cardiovascular death in post-infarction middle-aged men. *Atherosclerosis*, **54**· 111–118 (1985).
9. KHAW, K-T. & BARRETT-CONNOR, E. Dietary potassium and stroke-associated mortality: a 12-year prospective population study. *New England journal of medicine*, **316**: 235–240 (1987).
10. DEUTSCHER, S. ET AL. Determinants of lipid and lipoprotein level in elderly men. *Atherosclerosis*, **60**: 221–229 (1986).
11. AMERY, A. ET AL. Efficacy of antihypertensive drug treatment according to age, sex, blood pressure, and previous cardiovascular disease in patients over the age of 60. *Lancet*, **2**: 1349–1354 (1985).
12. CRUICKSHANK, J. M. ET AL. Benefits and potential harm of lowering high blood pressure. *Lancet*, **1**: 581–584 (1987).
13. RICHARD, J. L Les essais de prévention primaire multifactorielle des cardiopathies ischémiques. *Revue d'épidémiologie et santé publique*, **33** 121–133 (1985).
14. ROSE, G. Strategy of prevention: lessons from cardiovascular disease. *British medical journal*, **282**: 1847–1851 (1981).
15. ABBOTT, R. D. ET AL. Risk of stroke in male cigarette smokers. *New England journal of medicine*, **315**: 717–720 (1986).
16. MOORE, R. D. & PEARSON, T. A. Moderate alcohol consumption and coronary heart disease: a review. *Medicine*, **65**: 242–267 (1986).
17. KANNEL, W. B. & MCGEE, D. L. Diabetes and cardiovascular disease: the Framingham Study. *Journal of the American Medical Association*, **241**: 2035–2038 (1979).
18. STAMLER, J. Review of primary prevention trials of coronary heart disease. *Acta medica Scandinavica, Supplement 701:* 100–128 (1985).
19. *World health statistics annual 1983*. Geneva, World Health Organization, 1983.
20. WHO Technical Report Series, No. 732, 1986 *(Community prevention and control of cardiovascular diseases*: report of a WHO Expert Committee).