

CHRONIC DISEASES

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Introduction

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1. The first part of the course is devoted to the study of the foundations of the theory of functions of a complex variable. This includes the study of the properties of analytic functions, the theory of residues, and the theory of conformal mappings.

Note

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FOREWORD

The second issue of Public Health in Europe is devoted to chronic diseases. One of the long-term programmes of the Regional Office for Europe of the World Health Organization is concerned with the development of a control programme in the field of cardiovascular diseases, and several years' experience in the eighteen countries where special ischaemic heart disease registers are established has shown that co-operation and co-ordination in this field are of great importance in developing the most effective methods of control. Particular attention is given to prevention and rehabilitation and to the cost of cardiovascular diseases to the community.

Another of the main diseases in the European Region, cancer, is also considered in this issue. Trends in European cancer control during the sixties are analysed, from the time when the Regional Committee for Europe, meeting at Luxembourg in 1961, discussed cancer control as a public health problem to the present, showing that the countries of the Region have made considerable progress in further developing their own control programmes. Epidemiological studies and mass screening for the early detection and prevention of cancer are also analysed.

Two other chronic diseases are discussed here: endemic nephropathy, which has a peculiar distribution in the European Region, especially in the Balkan countries, and trachoma, together with related matters of public health ophthalmology.

Selected health statistical information on countries in the Region was presented in the first issue in the form of tables and graphs. This feature is continued here, emphasis being placed on material and statistics relating to chronic diseases (cardiovascular diseases and cancer); material on chronic bronchitis and diabetes is also included.



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THE WORLD HEALTH ORGANIZATION'S HEART CONTROL PROGRAMME

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Cardiovascular diseases are one of the most urgent public health problems in industrialized countries of the WHO European Region, accounting for nearly one-half of the total mortality, of which, in turn, one-half is due to ischaemic heart disease.

The epidemic increase in the incidence of ischaemic heart disease among males of productive age affects not only the life of the patient and his family but also the economy of his country. In Czechoslovakia, for instance, 36.6% of all invalidity pensions awarded in 1970 related to cases of cardiovascular disease (fig. 1). Among males, nearly one-half of the cases of invalidity resulted from ischaemic heart disease.

In spite of the progress made in cardiovascular research since World War II and improvements in the care of cardiac patients, the implementation of measures which should result in significant changes in the present unfavourable trends among populations has not yet been achieved. The introduction of control measures at community level is very limited and in some cases has not been initiated at all.

The reasons are understandable. There is, for example, on the one hand a lack of knowledge of the results of preventive measures in ischaemic heart disease when applied to persons of middle age or older. On the other hand, the organizational problems connected with the efficient introduction of such measures, even on a trial basis, would often reach far beyond the present capacity and influence of the medical profession.

As far as future development is concerned, the present age composition of the populations in industrial countries of the European Region, as well as the low birth rate in these countries, means that the problem of cardiovascular diseases and, specifically, of ischaemic heart disease, will continue to be of importance for public health in the coming decades. Only by solving the problem of the effective prevention of atherosclerosis could a dramatic change be brought about.

However, given our present knowledge and its proper application in the community health services, a significant improvement could be achieved. Any community control programme includes components dealing

with prevention, early diagnosis and detection, treatment, including rehabilitation, education of health personnel as well as public health and research. Naturally systems and methods have also to be included that permit results already achieved to be evaluated.

In view of the extent of the cardiovascular diseases programme in the community, we have to try to integrate any organizational measures necessary for the establishment of an efficient community control programme into the existing system of medical care as organized in each respective country or area.

The prerequisite for establishing an efficient comprehensive control programme is an accurate knowledge of the incidence of the disease in the community and detailed information about the persons affected. On the basis of this information, proper planning can be started and evaluation of the organizational measures can be carried out.

The present programme of WHO in the field of cardiovascular diseases, and specifically the programme being carried out in the European Region, has as its goal to develop and test methods which may help the public health authorities in interested countries to establish comprehensive cardiovascular disease community control programmes. This WHO programme was started in 1968 at the request of the governments of the Member States.

In its first phase, which covered the years 1968-1972, the programme dealt mainly with ischaemic heart disease (fig. 2). It comprised projects dealing with prevention, the collection of better information on the extent and impact of the disease in the community, and treatment, including rehabilitation and the long-term follow-up of patients. In 1971 the second phase, covering the years 1973-1977 was approved. In this phase the programme will be expanded to include projects dealing also with the public health problems of hypertension, stroke, rheumatic fever and rheumatic heart disease, congenital heart malformations and chronic chest diseases leading to cor pulmonale (fig. 3).

The programme is not executed independently by WHO. Co-operation and co-ordination of activities have been established with the International Society of Cardiology and its different councils, the European Society of Cardiology, the Council of Europe and its Rehabilitation and Re-employment Committee, the Ischaemic Heart Disease Register Group of Socialist Countries and, naturally, the different units of WHO Headquarters (fig. 4).

Having in mind the final aim of the programme, namely, the establishment of national community cardiovascular control programmes, it was considered essential first to develop close collaboration with established scientific institutions in each country as well as with their respective public health authorities. Through active participation in the programme and studies, each of the collaborating scientific institutions should

become the nucleus of national activities directed towards the development of community cardiovascular disease control programmes adapted to the specific needs and features of each country. With the support of national authorities such a network has been established throughout the European Region (fig. 5).

In view of the goal of the programme, great importance is attached to training, and the teaching of epidemiological methods became the centre of interest (fig. 6). Altogether 280 fellowships were awarded during the first four years of this programme, covering 598 fellowship months. One-fifth of the fellowships and one-half of all the fellowship months awarded were in the field of epidemiology. Under the training project a joint study on programmes of specialization in cardiology in Europe has also been undertaken jointly by the WHO Regional Office for Europe and the European Society of Cardiology. Thanks to these intensive efforts in the field of training the development of individual projects in countries involved has progressed satisfactorily.

From the very beginning, the project on the establishment of ischaemic heart disease registers was considered a key one for the whole programme. The registers, established in well defined population areas, should provide the public health administrator with the information necessary for more efficient planning of health services and evaluation of new methods of care for patients with myocardial infarction and the researcher with a tool to study the natural history of the disease. There are now twenty such registers collaborating with the WHO Regional Office, eighteen of them in the European Region. At present information on more than 13 000 cases of subjects under the age of 65 having or suspected of having acute myocardial infarction, fatal or non-fatal, in the respective areas is available. For the final analysis of the feasibility study it was decided to include data from the year 1971, when information on over 8900 patients was available.

The data to be published in 1973 in the form of a WHO monograph will give the relevant information on the pre-attack history, the distribution of time between onset of symptoms and death, the place of the attacks and of death, the sex and age distribution of patients in different populations and population age-groups. Conclusions can also be drawn about the efficiency of the organizational measures applied to care for patients with acute myocardial infarction in each community.

The registers have justified their existence. In the majority of the cases it has already been possible to incorporate them in the local health systems. They have acted, too, as a bridge between clinical medicine and public health administration. They have made physicians aware of the coronary heart disease programme and the control of the disease in the community; they have provided essential information on the natural history of myocardial infarction in the respective areas. They have stimulated interest among doctors and health personnel in disease control problems on a community basis, have improved knowledge about diagnostic

criteria, treatment and rehabilitation and have established a system providing data for further epidemiological and organizational studies.

As a natural continuation, several centres, on the basis of the registers, are now carrying out studies on the primary prevention of ischaemic heart disease. As an example one should cite the project being carried out in North Karelia, Finland. In other centres secondary preventive trials have been started. The evaluation of rehabilitation programmes is also being carried out. The results of the project on the significance of different symptoms preceding myocardial infarction is of great importance in reducing mortality during the first hours after the attack and the registers could, even in this respect, be used as a tool for providing information.

Some centres have already introduced simplified registration schemes and have modified their previous forms and operating protocols used in the pilot studies with the aim of enlarging the areas where cases of myocardial infarction will be registered.

In other centres the registration schemes have been expanded to include stroke and hypertension. These efforts are aimed at developing, on a pilot basis, an information system which might then serve as a comprehensive cardiovascular community control programme covering the diseases which are of most importance in the industrialized countries. At the same time, the integration of the schemes in the existing systems of medical care organization are tested.

This WHO programme in the field of cardiovascular diseases has, during the last five years, created a basis and network in different countries which can, through international collaborative work, act to stimulate the application, as soon as they are available, of all measures necessary to control different cardiovascular diseases in the most comprehensive way.

Fig. 1

CARDIOVASCULAR DISEASES IN CZECHOSLOVAKIA - 1970

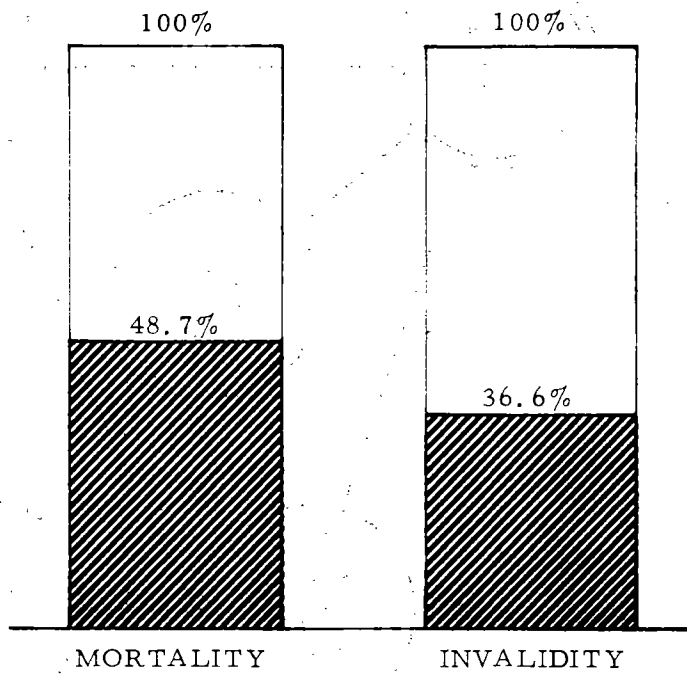


Fig. 2

WORLD HEALTH ORGANIZATION
REGIONAL OFFICE FOR EUROPE

CARDIOVASCULAR DISEASES PROGRAMME, 1968-1972

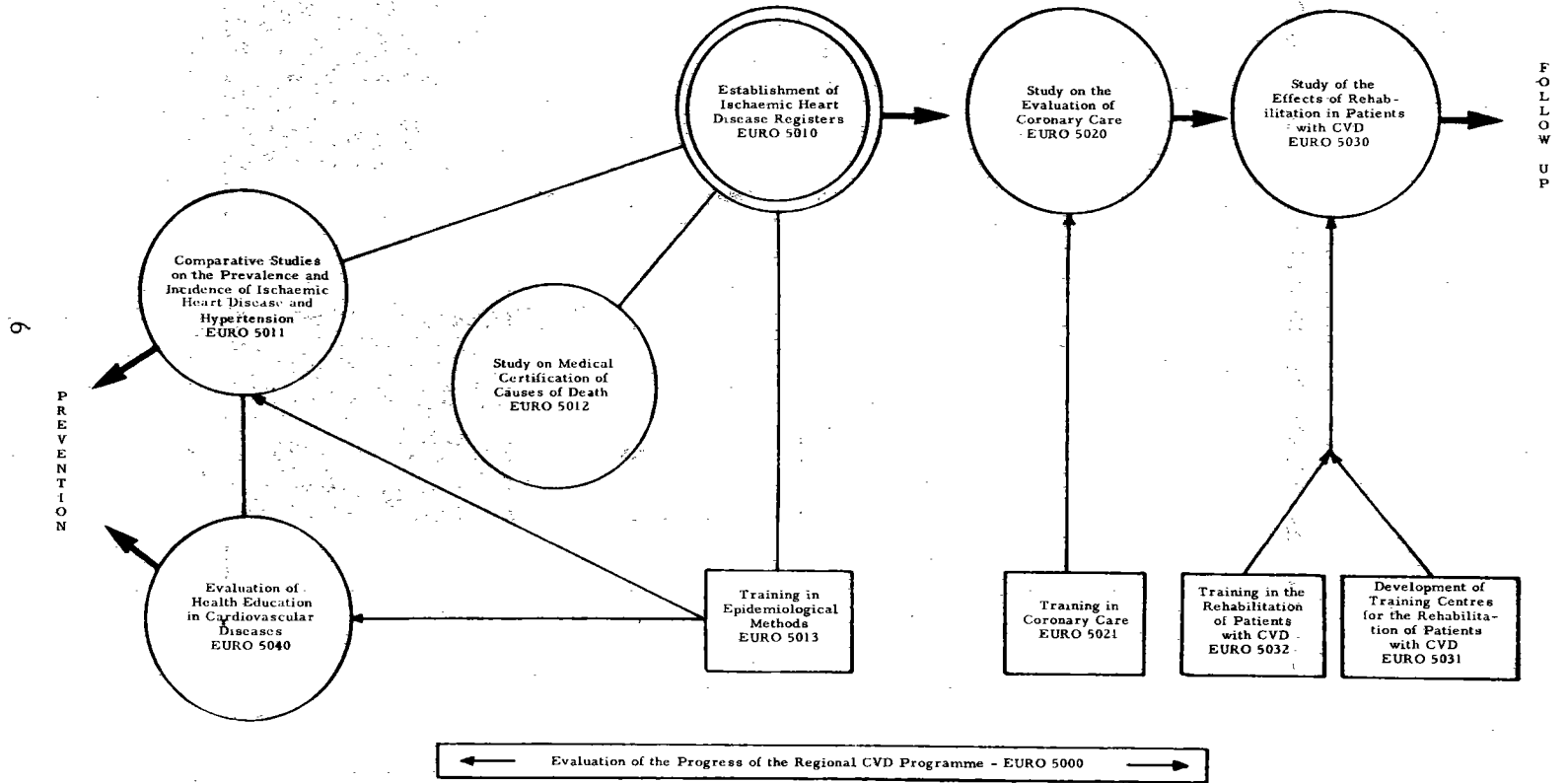


Fig. 3 Descriptive chart of the cardiovascular diseases programme of the WHO Regional Office for Europe from 1973 onwards

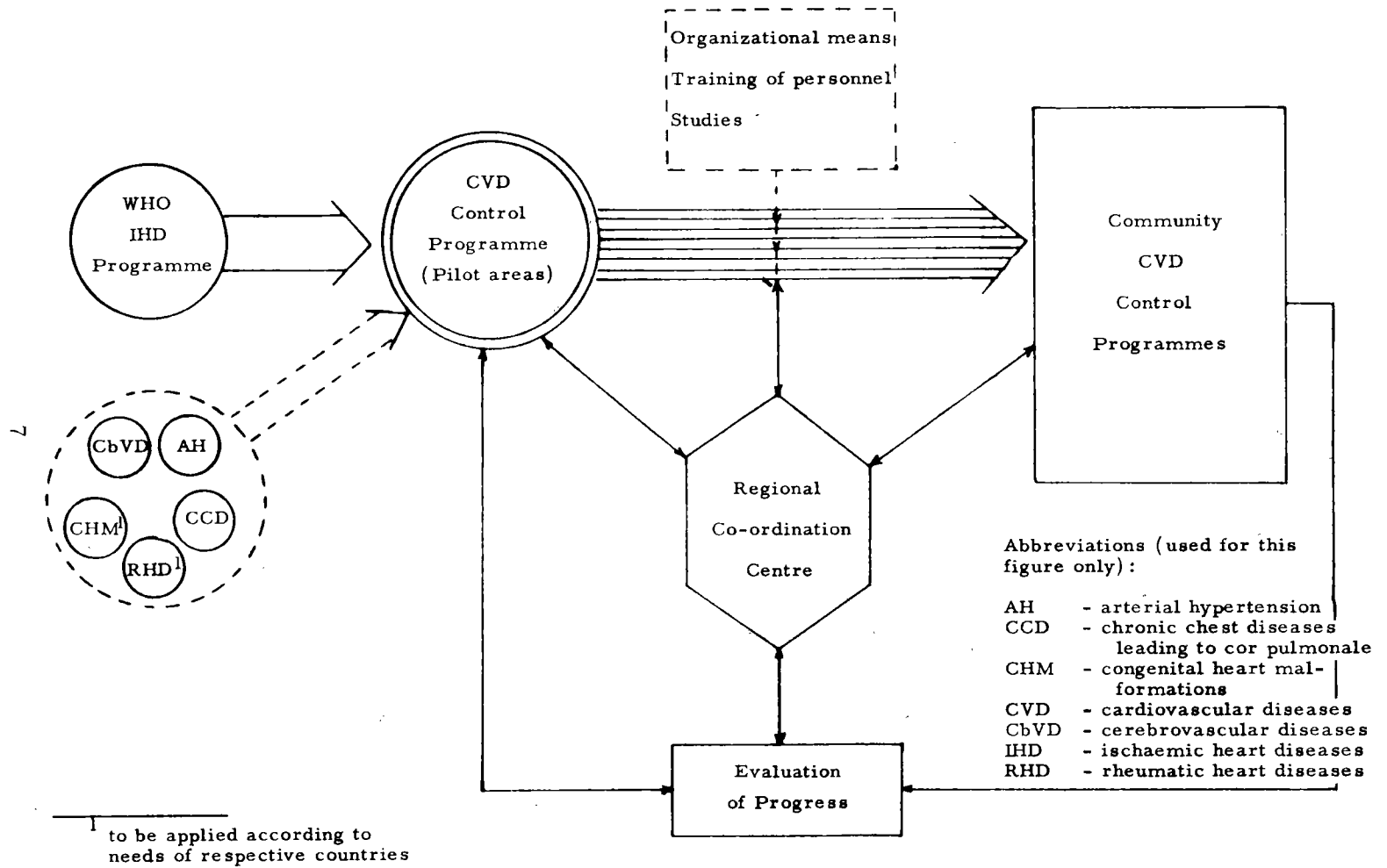


Fig. 4 WHO REGIONAL OFFICE FOR EUROPE CARDIOVASCULAR DISEASES PROGRAMME
COLLABORATION

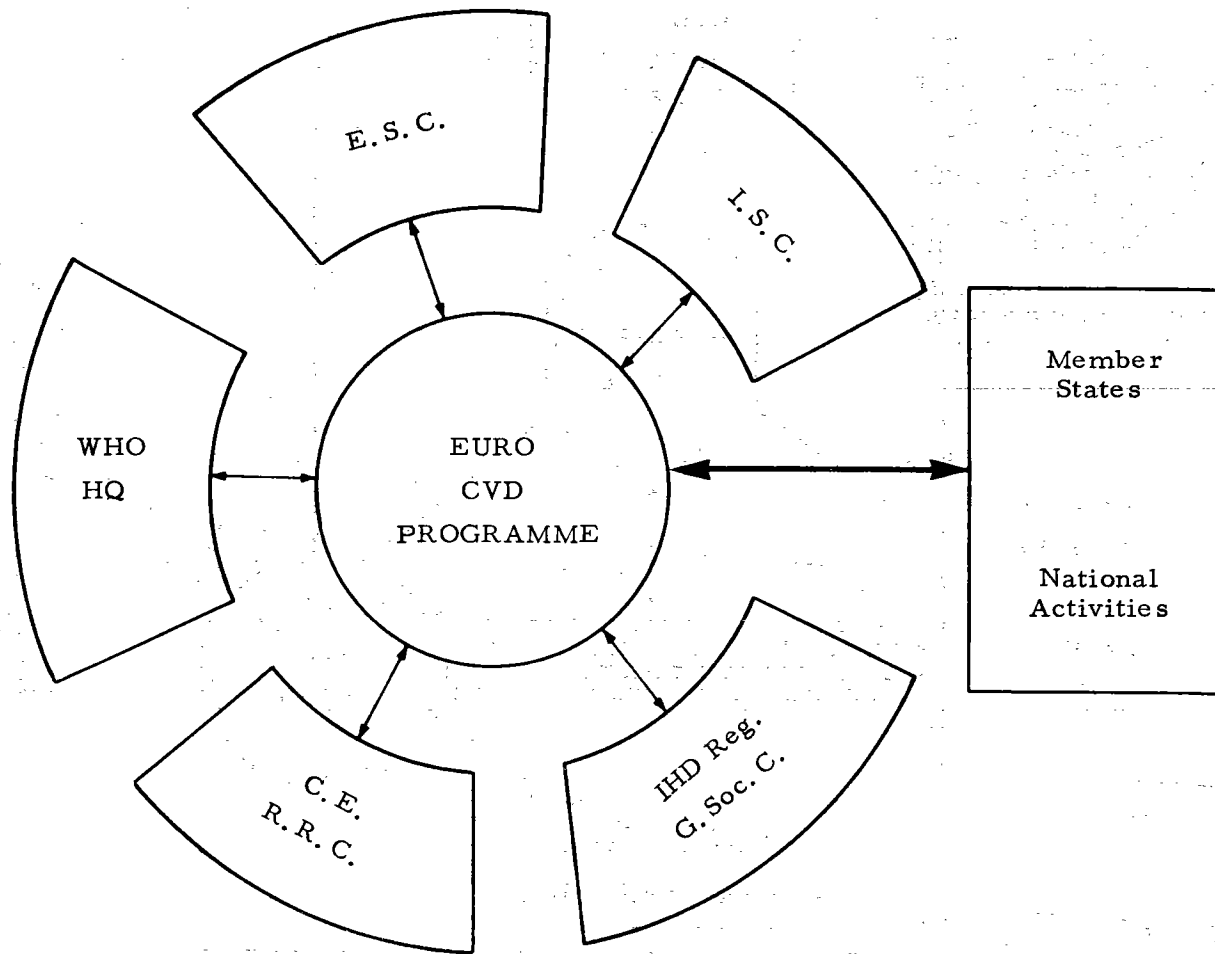
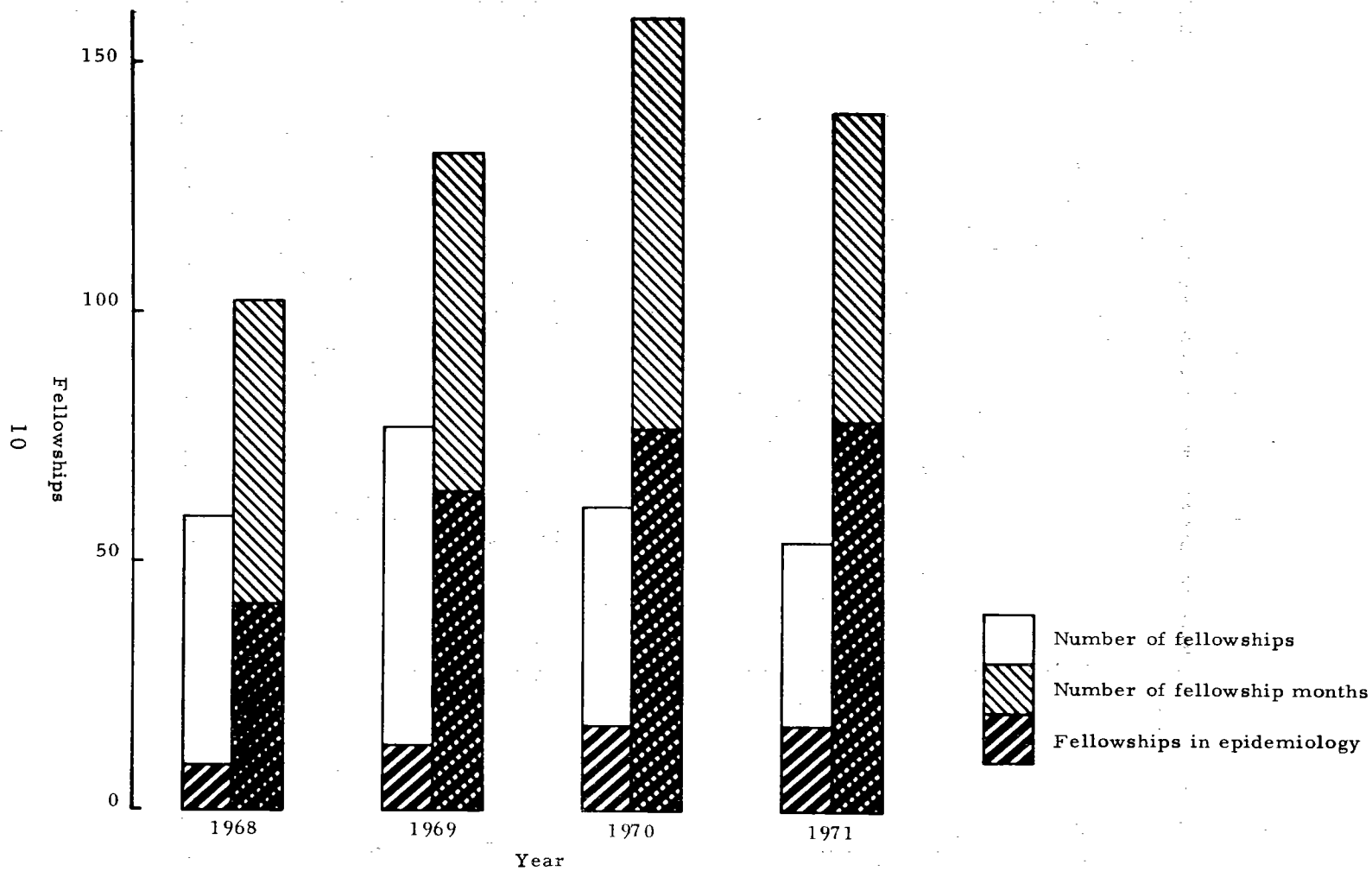


Fig. 6

FELLOWSHIPS GRANTED IN THE FIELD OF CARDIOVASCULAR DISEASE CONTROL



PREVENTION OF CARDIOVASCULAR DISEASES ¹

by
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1. The problem

Cardiovascular diseases occur throughout the world. Some, such as arterial hypertension, rheumatic fever and rheumatic heart disease, cerebrovascular lesions and certain congenital malformations, are commonly found everywhere, although there may be local differences in their frequency, clinical manifestations, etiology and pathogenesis. Others, such as ischaemic heart disease, Chagas' disease and cardiopathies of unknown etiology, are found only or predominantly in certain geographical areas or among specific groups of people.²

On a world-wide scale, cardiovascular diseases can be considered the major and, in many countries, the leading cause of death. In about 50 countries in all continents, where reliable statistics are available, cardiovascular diseases account on an average for 37% of all deaths, which means a higher mortality than that caused by malignant neoplasms, accidents or infectious diseases.³ Although the mortality increases with age, cardiovascular diseases are not an inevitable consequence of aging. For example, data from 29 economically advanced countries show that in 1967 about 39% of all deaths among men aged 25-65 years were caused by cardiovascular diseases, and 25% of all deaths by ischaemic heart disease alone followed by stroke. The relevant figures for women are 33% and 14% respectively. Deaths from malignant neoplasms in the same age-group amounted to 23% in men and 34% in women; those from accidents, poisoning and violent deaths to 14% and 7% respectively (fig. 1). If one accepts that the average expectation of life for men, at birth, is more than 67 years, and about 74 years for females, 39% of males and 33% of females died prematurely because of cardiovascular diseases.

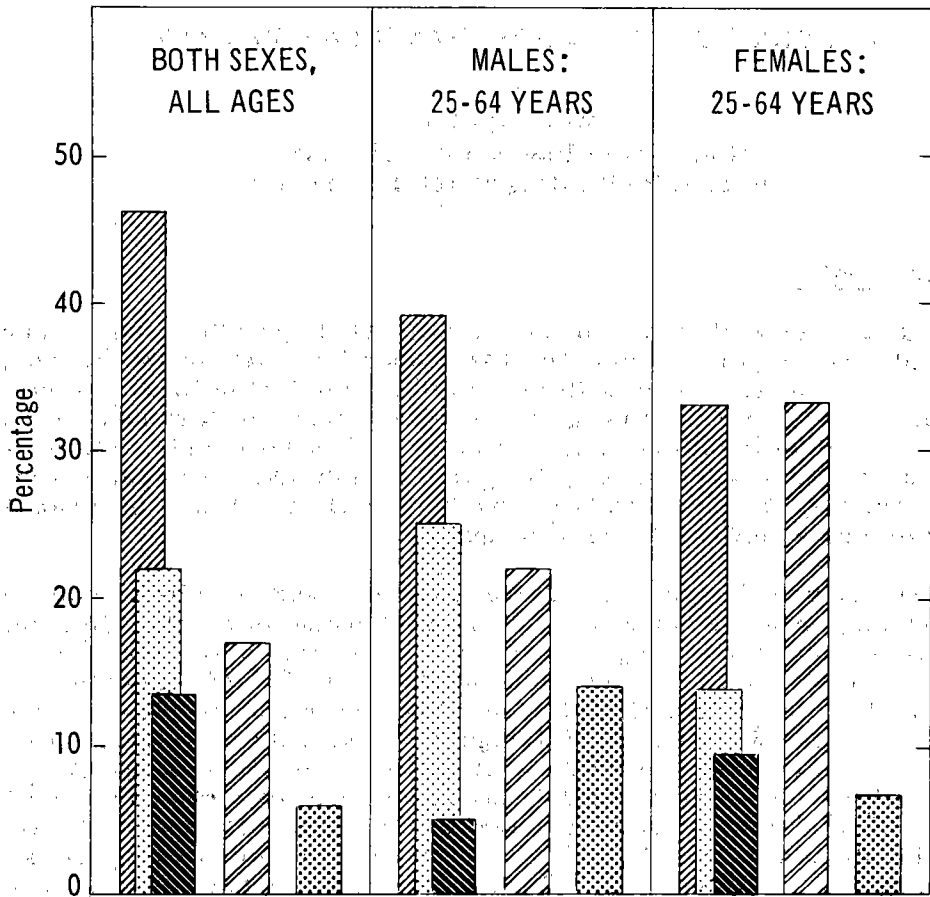
¹ Reproduced by kind permission of Médecine et Hygiène, Geneva

² International Work in Cardiovascular Diseases, 1959-1969, WHO, Geneva, 1969






³ World Health Statistics Annual 1967, WHO, Geneva, 1970

MAJOR CAUSES OF DEATH (IN % TO ALL CAUSES OF DEATH)
MEAN VALUES OF 29 COUNTRIES¹

Fig. 1



WHO 10861

-  all CVD (A70, A79-86)
-  Arteriosclerotic Heart Disease (A81)
-  Cerebrovascular Diseases (A70)
-  Malignant Neoplasms (A44-A59)
-  Accidents, Poisoning and Violence (AE 138-AE 150)

¹ Based on data in World Health Statistics Annual, 1967 (published by WHO in 1970)

Rheumatic fever and rheumatic heart disease also contribute greatly to the mortality among young subjects. In 1968, for example, they were the second most frequent cause of death (after accidents) in four European countries.¹

Analysis of the life tables shows a decreasing trend with age in the expectation of life in men between 1958 and 1968, which is caused predominantly by deaths from cardiovascular diseases.²

A considerable increase in mortality from ischaemic heart disease has been noted in countries where, 10 to 15 years ago, death rates were low and relatively rare in the younger age-groups.³

Examples from Czechoslovakia, Finland, Japan, Switzerland and the USA may illustrate the differences in mortality from various cardiovascular diseases, and changes in the past years (figs. 2, 3, 4 and 5).

The increase in death rates from ischaemic heart disease in Czechoslovakia, Finland and Switzerland is most marked in the lower age-groups. In Japan there is a rise in mortality in the older age-group, whereas no change can be seen in the USA. Mortality from vascular lesions of the nervous system and from rheumatic heart disease has been decreasing.

Fig. 6 shows mortality ratios, between males and females, from ischaemic heart disease. Values above one indicate that mortality is higher in men. During the past 12 years the mortality has increased more in males than in females. The continuing increase in mortality in men, as compared with women, indicates that the reasons for this may not be long-lasting, although one has to take into consideration that the present most vulnerable generation in Europe was born during the First World War, or immediately afterwards, when nutrition of many populations in Europe was inadequate.

Apart from premature deaths at the height of active life, invalidity caused by cardiovascular diseases is an increasing burden. Accepting that ischaemic heart disease is related to the way of life in the modern society, a further increase may be expected in all areas which are rapidly undergoing a similar transformation, and in which, also, mortality of infants is rapidly decreasing, thus allowing for a gradual increase in the life span.

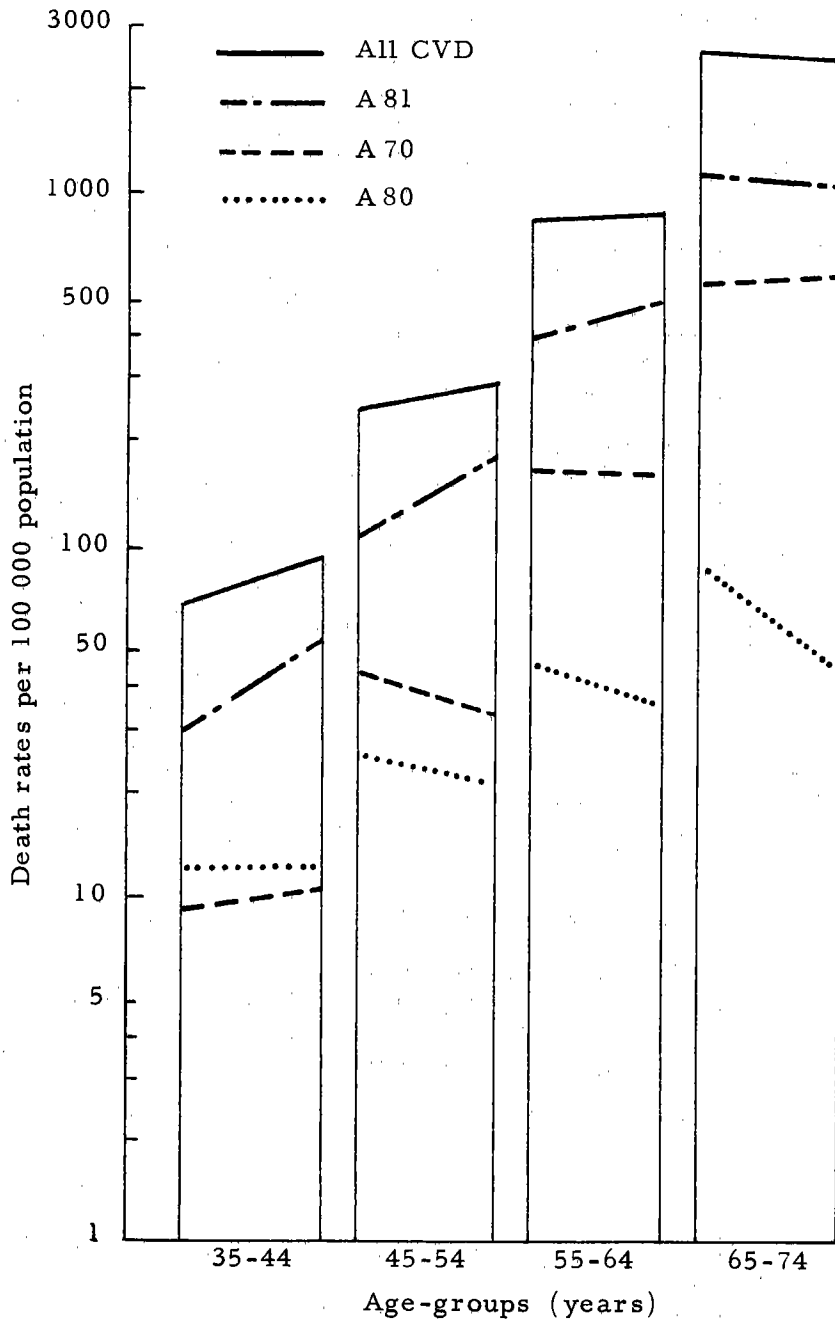
¹ World Health Statistics Annual 1969, I, WHO, Geneva, 1972

² World Health Statistics Rep. 25, No. 5, 430-442, 1972

³ International Work in Cardiovascular Diseases, 1959-1969, WHO, Geneva, 1969

Fig. 2

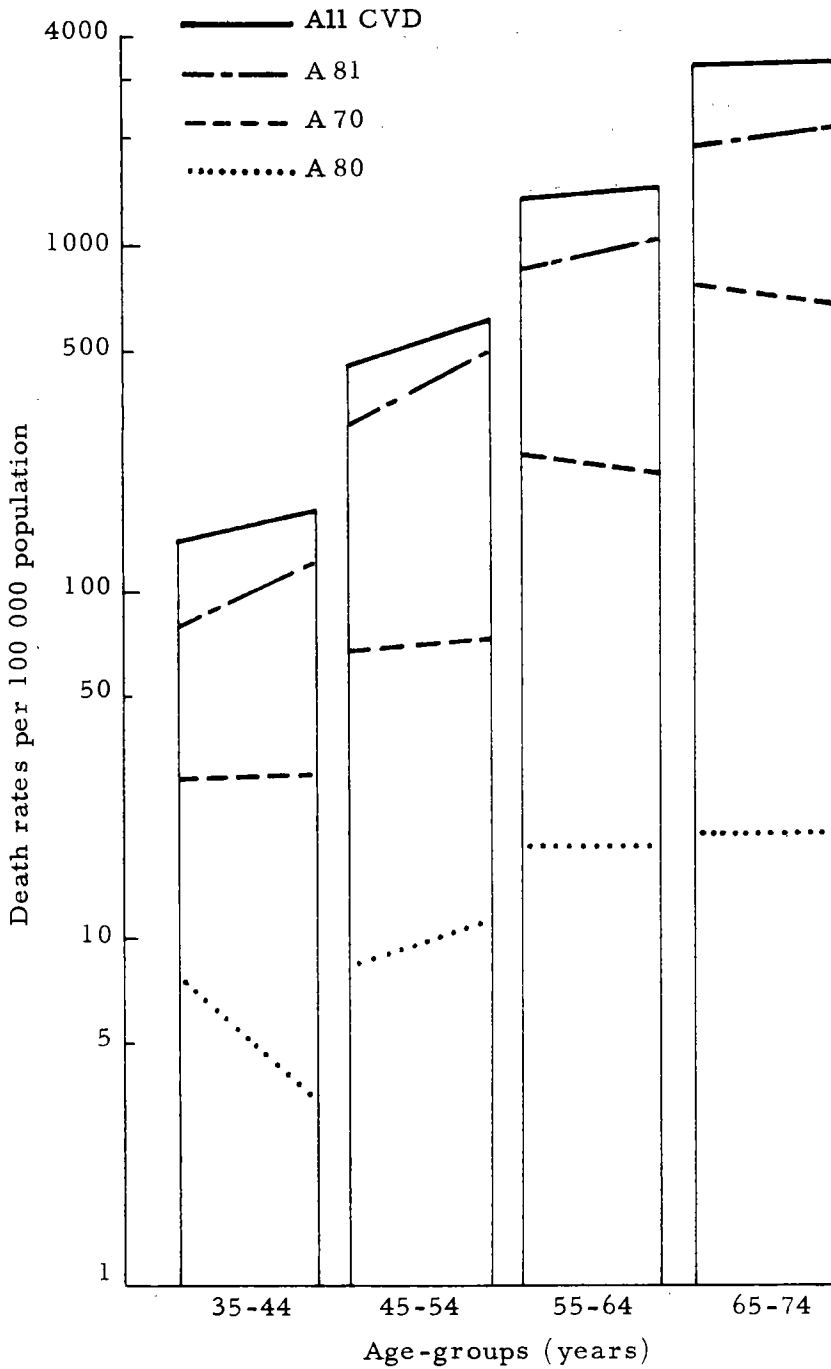
CZECHOSLOVAKIA
CVD MORTALITY (MALES) 1956-1967



In each column the left-hand bar represents the year 1955 and the right-hand bar 1967.

FINLAND
CVD MORTALITY (MALES) 1955-1967

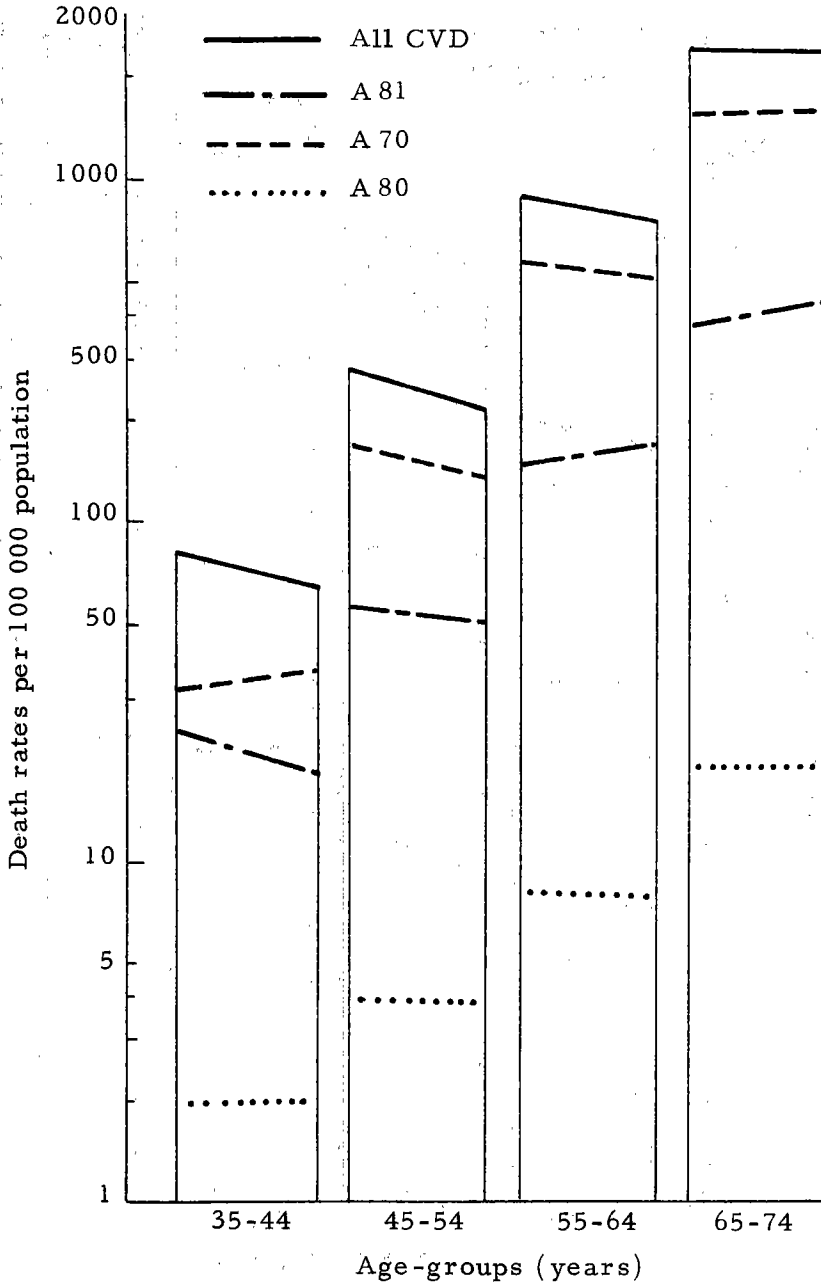
Fig. 3



In each column the left-hand bar represents the year 1955 and the right-hand bar 1967.

Fig. 4

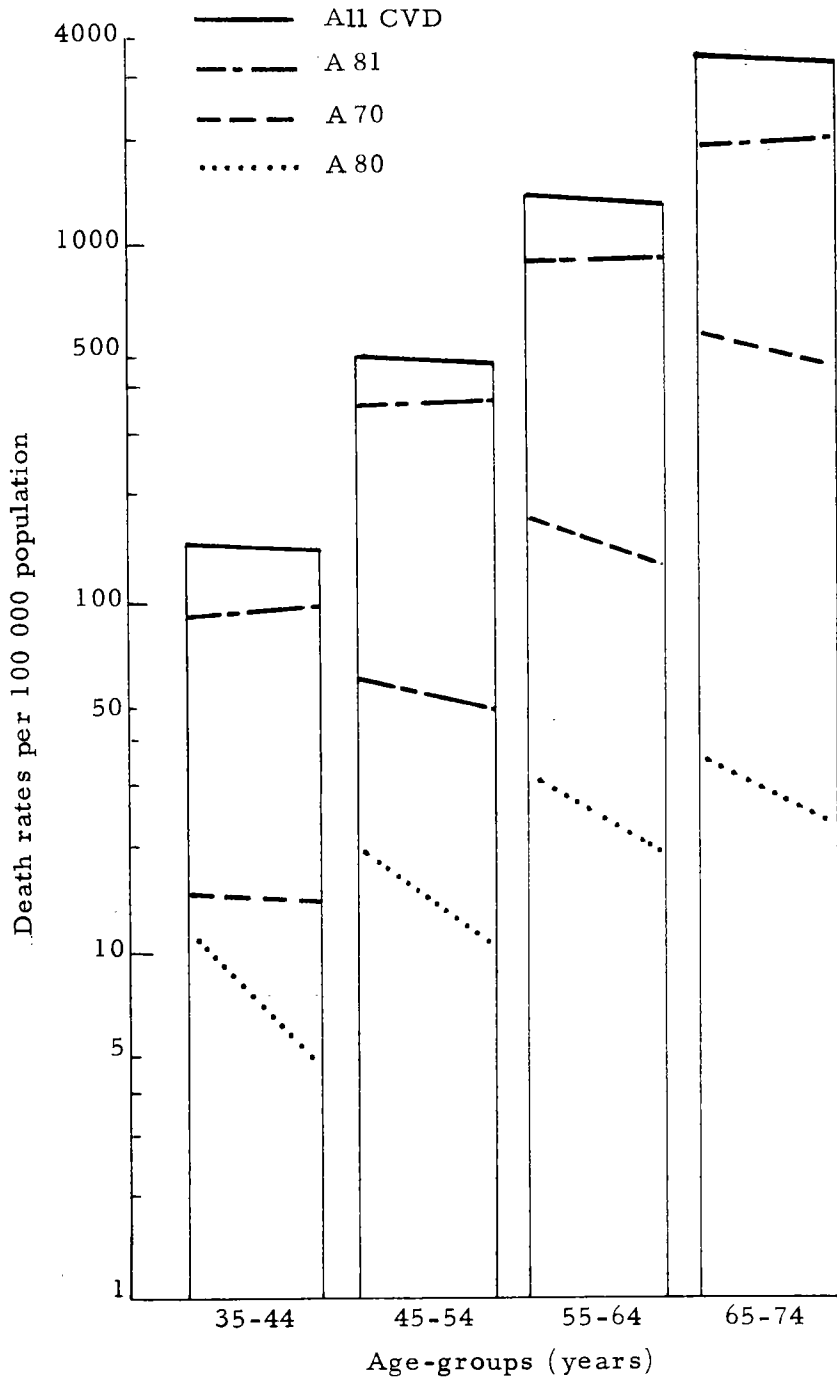
JAPAN
CVD MORTALITY (MALES) 1955-1967



In each column the left-hand bar represents the year 1955 and the right-hand bar 1967.

USA
CVD MORTALITY (MALES) 1955-1967

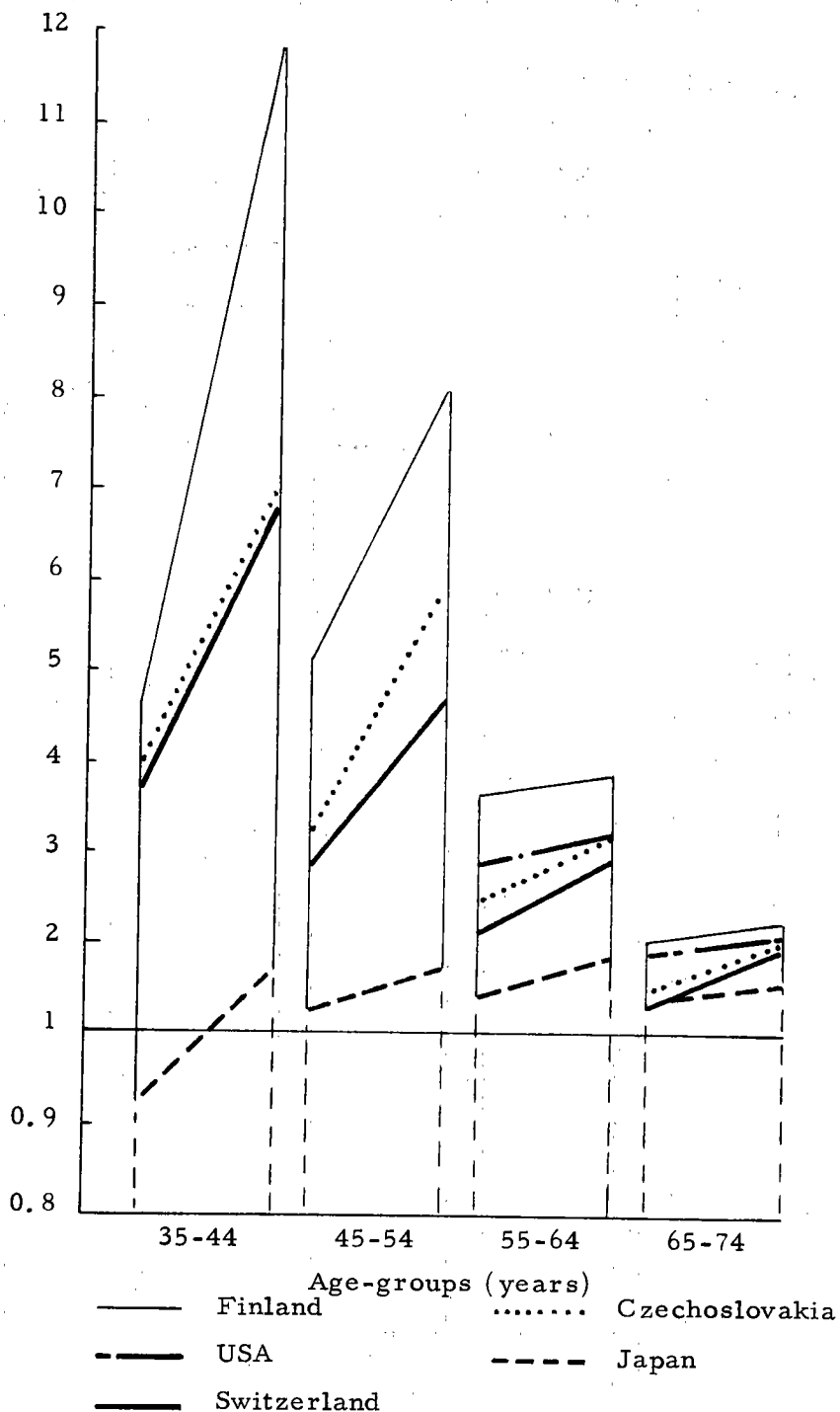
Fig. 5



In each column the left-hand bar represents the year 1955 and the right-hand bar 1967.

ISCHAEMIC HEART DISEASE MORTALITY RATIO
(MALES/FEMALES) 1955-1967

Fig. 6



In each column the left-hand bar represents the year 1955 and the right-hand bar 1967.

Like many other problems of today, that of cardiovascular diseases is becoming more and more urgent as far as young people are concerned. Congenital malformations are an obvious paediatric problem. Rheumatic fever and rheumatic heart disease, particularly in hot areas where there is overcrowding and where hygienic measures are inadequate, and cardiomyopathies of infectious, parasitic and unknown causes, occur mainly in youth. Hypertension resulting from glomerulonephritis or pyelonephritis usually has its roots in childhood. Atherosclerosis in some vessels also begins in childhood, although its most serious complications in the heart and brain usually become manifest in middle age.

The present possibilities for prevention and control at the level of the community are shown in table 1. Enough knowledge already exists for the effective control and prevention of rheumatic heart disease, chronic cor pulmonale and heart diseases connected with infections. Essential hypertension can be efficiently controlled so that its serious complications, such as hypertensive heart disease and cerebrovascular disease, are reduced. Although it is not yet possible to prevent the occurrence of ischaemic heart disease or peripheral vascular diseases of atherosclerotic origin, timely treatment and rehabilitation of subjects with acute myocardial infarction allows the majority to resume previous life activities. These possibilities are well known and have been summarized also in WHO publications.¹ However, they have not been applied adequately in many areas where these conditions are common. Furthermore, even in places with excellent facilities, control programmes do not reach everybody in the community, and in general have not yet been included into basic health services.

It is evident, therefore, that great effort is needed in order to achieve good control of cardiovascular diseases at a community level. Application of our existing knowledge in all cases would considerably reduce the toll; as for ischaemic heart disease and atherosclerosis, further research investigations are necessary before large-scale or mass prevention measures can be considered.

2. Preventable heart disease

Prevention of rheumatic fever and of Chagas¹ disease is a classical example, showing the contradictions between the possibilities of medicine and the application of these possibilities for the benefit of everyone in the community.

Rheumatic fever is a complication of streptococcal pharyngitis, which occurs in all ethnic groups throughout the world and is preventable. Both rheumatic fever and rheumatic heart disease have ceased to be an important

¹ Wld Hlth Org. techn. Rep. Ser., Nos. 126, 213, 231, 270, 342 and 469; reports of Regional Conferences (EURO 1965, WPRO 1968, SEARO 1970 and EMRO 1973)

Table 1

PRESENT POSSIBILITIES FOR PREVENTION
AND CONTROL OF CARDIOVASCULAR DISEASES
IN THE COMMUNITY

| | Prevention | Community control |
|---|------------|-------------------|
| Congenital | - | - |
| Rheumatic fever and rheumatic heart disease | + | + |
| Hypertension | - | + |
| Ischaemic heart disease | - | - |
| Stroke | + | + |
| Peripheral vascular disease | - | - |
| Vein varicosities | - | - |
| Cor pulmonale | + | - |

public health problem in the economically developed countries where hygienic measures are satisfactory, although there are still considerable variations in mortality from chronic rheumatic heart disease (figs. 2, 3, 4, 5). However, they are very common in many countries of the semi-tropical and tropical belts.¹

Severe valvular deformations of such magnitude that only surgery can help are very frequent in children. Overcrowding and large-scale population movements are not balanced by adequate hygienic measures or by systematic treatment of streptococcal infections. Infections in the skin often lead to acute glomerulonephritis, which is sometimes found in epidemics but which constantly appears in departments of medicine or paediatrics.

It is very easy to say that improved hygiene and early treatment with antibiotics can prevent severe valvular lesions. However, it was several years before we were able to introduce the concept of treatment

¹ Strasser, T. & Rotta, J., The control of rheumatic fever and rheumatic heart disease: an outline of WHO activities, Chron. Wld Hlth Org., 27, 49-54, 1973

and prophylaxis in selected areas where the disease is very common, with the aim of demonstrating that such prevention is possible and that its cost may be less than that of continuous care for cardiac patients suffering from rheumatic heart disease.^{1,2}

The main objectives of the Organization's programme in this field are to survey known cases of rheumatic fever and rheumatic heart disease, and to give such patients regular penicillin prophylaxis to prevent relapses and deterioration. Comparison of community-based programmes in different areas with a high incidence of rheumatic fever in children should demonstrate the advantages of this approach, as compared with the burden of caring for non-treated subjects developing rheumatic heart disease.

Chagas' disease is another example of the disparity between the present possibilities for prevention and the real situation. It has been estimated that about 35 million people in Latin America are exposed to it, and 7 million infected, most of them already in childhood. The majority survive the acute disease, but after some years manifest heart disease or gastrointestinal disease occurs in about one-tenth of them.^{3,4,5,6} The latter is most probably caused by damage to the vegetative nervous system. Sudden death in seemingly healthy persons, or rapidly progressing cardiac failure in those where myocardium is gradually replaced by fibrous tissue, are two extreme consequences. It has been proved that regular spraying of dwellings in endemic areas and the construction of adequate houses eliminates the vector and will dramatically reduce the number of infected children. It is doubtful, however, that this can be achieved in all endemic areas during the next 20 years. One possibility is control of transmission of the vector through some means other than the use of insecticides, and investigation along these lines is being pursued by WHO.

¹ Epidemiological study and control of streptococcal infections, rheumatic fever and glomerulonephritis: Proposal for an international co-operative study, WHO, Geneva, 1971 (Int. doc. CVD/70.5)

² WHO programme on rheumatic fever prevention: Report of a consultation held in Cairo, 19-22 February 1972 (Int. doc. CVD/72.2)

³ Introduction to the Cardiomyopathies, Cardiologia, 52, No. 1-2, 1968

⁴ Comparative studies of American and African Trypanosomiasis, 1969, (Wld Hlth Org. techn. Rep. Ser., No. 411)

⁵ Davies, J.M.P. & Fejfar, Z., Chagas' Disease in Brazil - A survey of clinical and pathological aspects (Int. doc. PAHO, ACMR 4th, RES 4/10, 1965)

⁶ Clinical aspects of Chagas' disease: Report of a WHO/PAHO meeting of investigators, Caracas, Venezuela, 26-29 November 1971 (Int. doc. CVD/72.10)

In some areas, and perhaps after the eradication of malaria, acute Chagas' disease appears to be more frequent than before. The long time-lag has made it difficult in the past for medical people to understand the association between acute and chronic disease. The disease is still a great medical, social and educational problem for many rural areas. Great efforts are made and much money is spent on medical treatment of patients with cardiac disease, on implantation of pacemakers and on operating on subjects with megaesophagus or megacolon. Yet the association between improved health and work productivity does not seem strong enough, in comparison with other problems, for the relevant authorities to provide enough funds and personnel for nationwide preventive sanitary action. People from endemic areas do not understand, in general, the link between the bite of "vinchucas" and a chronic killing or disabling disease, and do not realize the importance of the necessary sanitary measures.

3. Cor pulmonale and respiratory diseases

Cardio-respiratory diseases of non-specific origin are ubiquitous and serious conditions, even in developing, tropical countries, and lead to premature incapacity, chronic respiratory failure and chronic cor pulmonale. Many of them can be well treated, and pulmonary hypertension and cardiac failure avoided. This applies particularly to common respiratory infections where avoidance of dust exposure and the elimination of cigarette smoking would be helpful. Relevant actions were recommended a long time ago,¹ but little has actually been done and chronic cor pulmonale remains a common condition.

4. Congenital malformations of the circulatory system

Another aspect of the present cardiovascular problems can be seen in congenital malformations of the circulatory system. Information from several studies indicates that such malformations occur in about 8 out of every 1000 live-born children. Two of these 8 die in the first year of life; this is more than 85% of all deaths from this cause in the first 15 years of life in countries where satisfactory health services and follow-up exist. The details of the situation in Europe may be found in the report of a WHO Working Group.²

Advance in cardiovascular surgery now allows the correction of the majority of congenital cardiovascular malformations and, combined with intensive medical treatment very early after birth, it may considerably reduce high infant mortality. We need to know, of course, to what extent

¹ Chronic Cor Pulmonale, Report of an Expert Committee (Wld Hlth Org. techn. Rep. Ser., 1961, 213)

² World Health Organization, Regional Office for Europe (1972) Congenital heart diseases in Europe, Report on a Working Group, Copenhagen, 13-16 September 1971, Copenhagen

the decrease of mortality in the first year would not simply postpone mortality until a later period - say in five to ten years - and we do not know to what extent this would be a further burden on the existing health services, traumatize the patients, etc., as only in a few places prospective follow-up studies exist.

A WHO Working Group has estimated that one well-equipped centre for diagnosis and treatment of congenital malformations would suffice for a population of three to five million. The centre should be in the same area as that for older children and adults. This may be less than existing institutions in a number of places, but this certainly does not apply only to treatment of congenital malformations in infants.

On the whole, the possibilities for care of a child with congenital malformation are greater than those for research on prevention of these conditions, but we know rather little about the early diagnosis during intrauterine life (composition of amniotic fluid, transplacental angiography, etc.); we know even less about how to prevent such conditions, apart from avoiding some viral infections or certain drugs. Furthermore, we have so far given little attention to the study of cardiovascular diseases in adults which may begin in childhood. The momentum of research in cardiology is, however, gradually shifting towards childhood, although this trend is still in the process of formation.

5. Arterial hypertension

Arterial hypertension is the commonest circulatory disorder in the world, about 10% of all adults, both male and female, having casual blood pressure values of 160 and/or 95 mmHg or above. The condition is infrequent only in some very primitive tribes and in populations living on high altitude plateaux. By far the greatest proportion of subjects are those with so-called essential hypertension followed by vascular and renal parenchymal disease. Hypertension caused by hormone-producing tumours is relatively rare. In some subjects, such as those stricken with schistosomiasis (haematobium), hypertension is secondary to pyelonephritis.

Since the early nineteen-fifties, drugs which lower essentially elevated blood pressure began to appear. Their rapid development entirely changed the prognosis for subjects with high blood pressure: patients with malignant hypertension could be maintained in good health for years. The continued treatment with hypotensive drugs proved that dominant complications of hypertension, e.g., stroke, hypertensive heart failure and hypertensive renal disease could be avoided to a great extent. It has not yet been proved, however, whether and to what extent such treatment would reduce the incidence of ischaemic heart disease, of which hypertension is one of the main pre-disposing factors.

The highly effective treatment is so far unfortunately given to only a fraction of hypertensive subjects, as many have no symptoms compelling them to see the doctor and long duration drug treatment is not followed.

The excellent possibilities for reducing serious complications of hypertension, and the lack of application of this treatment to all who need it, call for measures for the detection of hypertensive subjects at the early phase of the disease and appropriate treatment for whole communities. In order to justify mass screening measures which would cover the whole country, pilot studies have been developed by WHO in several continents. These should demonstrate within five years how health authorities should provide systematic nationwide services in diagnosis and care, and thus prolong active and satisfactory life for countless subjects with high blood pressure. Simultaneously, of course, the general public should be made aware of such developments and their active participation is essential for its success.¹

The document outlines graduated procedures, starting from adequate care of known hypertensive patients and ending with a nationwide screening of patients with elevated blood pressure. It also outlines the principles for organizing a hypertensive control programme and gives guidelines for this operation.^{1, 2}

While it is imperative to treat urgently all subjects with established hypertension, further research is needed on the natural history and prognosis of subjects with mild elevation of blood pressure and on the etiology and pathogenesis of essential hypertension. Here again, WHO has paid particular attention to areas where hypertension is infrequent. Research studies should also demonstrate the relationship of hypertension and ischaemic heart disease.

The "do-it-yourself" principle will gradually be applied more and more in removing unhealthy life habits and in promoting a way of life which, according to scientific evidence, may improve health and either remove or postpone the development of cardiovascular diseases in middle or old age.

The problem of juvenile hypertension with high cardiac output or of the so-called mild labile hypertension, without marked organic changes, has not yet been solved. We lack long-term observations on prognosis with regard to these subjects and, most probably, it will be necessary to organize a co-operative trial in which the endpoints should be progression of the condition rather than severe complications or death.

The trial will require the participation of a large number (several thousand) of subjects who will have to be followed up for several years.

¹ Control of stroke and hypertension in the community, Report of a WHO meeting, 29 November-3 December 1971 (Int. doc. CVD/72.1 - available on request)

² Community control of stroke and hypertension, Report of a WHO meeting, 8-10 November 1972 in Copenhagen and 13-16 November 1972 in Geneva

It will therefore be necessary to pool data from several places, in a way similar to that of the WHO co-ordinated trial on primary prevention of ischaemic heart disease.¹

The finding that arterial hypertension appears to be less common in subjects living at high altitude offers another possibility. Experimental studies on animals exposed intermittently to "altitude" pressure chambers may soon be extended to man. Walking in mountains was long ago accepted as a pleasant way to relax and improve one's physical fitness. Positive results of animal experiments may eventually lead to the construction of low pressure cinemas and similar places of entertainment in lowland areas, which would combine intellectual pleasure with physical stimulus for the homeostatic mechanisms.

6. Cerebrovascular diseases

After ischaemic heart disease, cerebrovascular diseases are the most common cause of death in the cardiovascular group, although in some countries mortality is on the decline, and there are great differences in the magnitude. Mortality from acute stroke is high; about a quarter of the patients die within 24 hours and one-third during the period of hospitalization. Reliable data on morbidity are available only from a limited number of community studies and are incomplete or non-existent in most parts of the world.²

The great majority of cerebrovascular accidents appear to be associated with arterial hypertension or atherosclerosis, or both. Prevention of the development of severe atherosclerosis and the control of hypertension are therefore the two key problems. At present, however, many patients with acute stroke have no access to adequate treatment and rehabilitation. WHO is, therefore, trying to stimulate community programmes whereby proper care would be taken of all patients. The programme will be closely related to the community control of hypertension.^{3,4}

¹ Heady, J.A., Primary prevention of ischaemic heart disease: An international trial of the effect of clofibrate, Bull. Wld Hlth Org. (in press)

² Cerebrovascular diseases: prevention, treatment, and rehabilitation, Report of a WHO meeting (Wld Hlth Org. techn. Rep. Ser., 1971, No. 469)

³ Control of stroke and hypertension in the community, Report of a WHO meeting, 29 November-3 December 1971 (Int. doc. CVD/72.1 - available on request)

⁴ Community control of stroke and hypertension, Report of a WHO meeting, 8-10 November 1972 in Copenhagen and 13-16 November 1972 in Geneva

7. Atherosclerosis and ischaemic heart disease

There are several reasons for the increasing attention given to ischaemic heart disease (IHD) by health workers and by the public in all regions of the world. The disease has reached worldwide proportions, striking more and more at younger subjects than before and causing great losses in human life and in economic productivity. As it is assumed to be associated with the present affluent mode of living, a further increase can be expected, which will result in the greatest epidemic mankind has faced, unless we are able to reverse the trend by concentrated research into the etiology, pathogenesis, care and prevention.

Early treatment and rehabilitation of all patients suspected of having acute myocardial infarction or with symptoms of imminent acute ischaemic heart disease, however, are already possible and should be available for all who need them. Prevention of ischaemic heart disease still requires considerable effort to impede the development of advanced atherosclerosis and thrombosis.

Epidemiological studies which started after the Second World War proved that IHD is not primarily an unavoidable problem of aging, and identified a number of factors promoting the development of atherosclerosis and provoking IHD. Several of these factors can be controlled or avoided. Efficient treatment of ventricular fibrillation and of other serious arrhythmias and conduction defects in acute myocardial infarction (AMI) led to the establishment in early 1960 of special units in hospitals for treating patients with AMI, and active rehabilitation added greatly to the early return of patients to previous life activities. More recently, open heart coronary by-pass surgery has further increased interest in the intensive treatment of patients with AMI and those with severe angina pectoris.

The excellent results in the treatment of AMI patients in coronary care units greatly excited the public as well as health workers. A number of studies, however, including WHO co-operative investigations into the community aspects of AMI, have confirmed that more than 50% of patients dying from AMI never reached the hospital. Emergency care for these patients outside the hospital and immediately after the attack should therefore be given first priority in order to reduce mortality. A WHO study in a number of European countries, in Israel and in Australia, provided basic information on the essential services, and advice to the public on the recognition of major symptoms, first aid measures and prevention. This latter related particularly to the diet, with moderation in calorie intake relating to physical activity and, in particular, reduction of the proportion of fat in the diet. The study relates a diminution of cigarette smoking to better physical fitness. The organization of community care programmes is also becoming the basis for secondary preventive programmes and should include future care and prevention of other cardiovascular diseases at the community level.

The epidemic proportions of IHD make it obvious that control of the condition can be achieved only by preventive measures which reach the entire population. In view of the unknown etiology and pathogenesis of atherosclerosis and of coronary heart disease, prevention so far aims at modifying the recognized risk factors. Most of them are linked with modes of living and behaviour and can therefore be approached by education. A number of primary preventive trials are under way, some of them sponsored and co-ordinated by WHO. Results are promising, but it is not yet possible to give final answers which could lead to radical changes in modes of living.

Atherosclerosis is known to develop from childhood. Investigations co-ordinated by WHO in Malmö, Prague and three areas (Ryazan, Tallin and Yalta) in the USSR, made it possible to collate relevant autopsy material on 17 455 cases. The fibrous plaques, complicated lesions and calcification in the left arterial coronary artery, which is well representative of the other coronary vessels, have been found in more than 80% of males in the 35-45 year age-group, the average extent being about 20% of the surface of the vessel. The frequency of the complicated lesions, i.e., haemorrhage, ulceration or thrombosis, began to increase at about the same time.¹ A similar evolution was found to develop about 10 years later in females.¹

The frequency of morphological signs of ischaemic heart disease shown by this co-operation study is given in table 2. It is obvious that the clinically manifest ischaemic heart disease is only a small visible part of the iceberg, and yet a smaller proportion of these subjects are treated and rehabilitated.

The evolution of atherosclerosis and ischaemic heart disease, in relation to known etiological factors, is shown schematically in fig. 7.² The full line indicates the evolution of atherosclerosis in epidemic areas, the dotted lines show the gradual increase of fibrous plaques in areas where ischaemic heart disease is rare. Prevalence of clinical ischaemic heart disease begins to rise about 10 years later than advanced lesions in the coronary vessels. The vascular lesions of the central nervous system (not shown in graph) begin about 10 years later than ischaemic heart disease.

¹ Annual Report of the Director-General for 1971, WHO, Geneva, 1972

² Fejfar, Z. & Masironi, R. (1971) Dietary factors and cardiovascular diseases - epidemiological studies in man. In: Proceedings of 3rd International Congress of Food Science and Technology, Washington D.C., 9-14 August 1970

Table 2

PATHOLOGICAL FINDINGS IN SUDDEN DEATH
IN MEN AND WOMEN AGED 40-59 YEARS¹

| | Men | | Women | |
|---|-----------|------|-----------|------|
| | Total No. | % | Total No. | % |
| All sudden deaths ² | 404 | 100 | 145 | 100 |
| Sudden deaths with fresh myocardial infarction | 112 | 27.7 | 19 | 13.1 |
| Sudden deaths with coronary occlusion and fresh myocardial infarction | 78 | 19.3 | 13 | 9.0 |
| Sudden deaths with coronary occlusion without fresh myocardial infarction | 27 | 6.7 | 3 | 2.1 |
| Sudden deaths with IHD ³ | 312 | 77.2 | 72 | 49.6 |

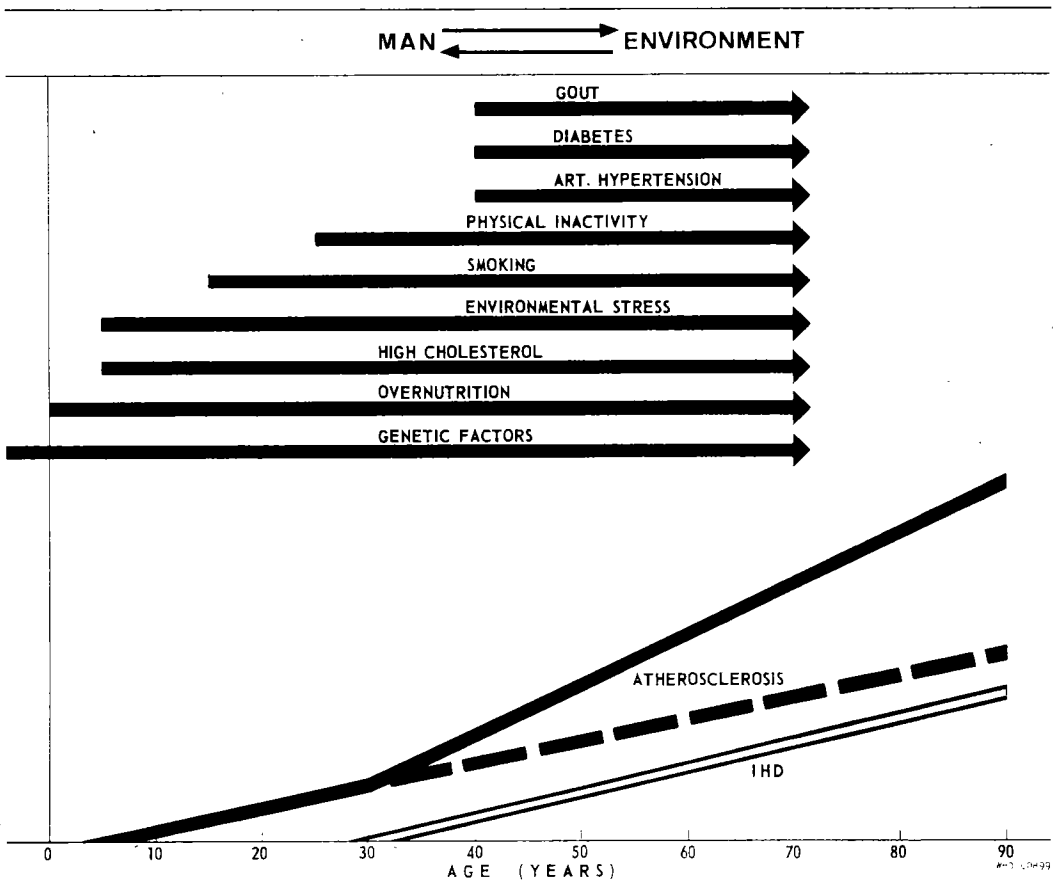
¹ Results of WHO population-related autopsy studies in Malmö, Prague 2, and Yalta

² In this study, sudden death was defined as non-violent death occurring unexpectedly within six hours of the onset of symptoms in an apparently healthy person or in a sick person whose condition was stationary or improving.

³ IHD = Ischaemic heart disease (fresh myocardial infarction, or scars, or occlusions in any coronary artery)

Source: Wld Hlth Org. techn. Rep. Ser., 1970, No. 441

Fig. 7 SELECTED "RISK" FACTORS IN ATHEROSCLEROSIS AND ISCHAEMIC HEART DISEASE, RELATED SCHEMATICALLY TO AGE



Source: World Health Organization (1971) WHO Chronicle, 25, 8

Schematically, hypertension, diabetes and gout may be considered to appear commonly at the age of about 40 years, i.e., at a time when the process of atherosclerosis is fairly advanced and when there are already ischaemic lesions in the myocardium. These factors may therefore advance the evolution of atherosclerosis, or even provoke acute cardiovascular accidents, rather than be the primary cause, even though hypertension in most population studies is an independent, important predisposing "risk" factor, as important as increased blood lipids. It has already been mentioned (page 30) that hypertension is the most common circulatory disorder, even in areas where ischaemic heart disease is rare and that, up to the present time, we have not succeeded in decreasing significantly the incidence of ischaemic heart disease by treating hypertension.

Among the Japanese in Japan, as is well known, the main circulatory problem is vascular lesions of the central nervous system. Among the Japanese who have been living abroad for a long time, for example in Hawaii, the incidence of ischaemic heart disease is rising, the blood level of cholesterol is higher but blood pressure does not change markedly.¹

The noxious effects of cigarette smoking in the development of ischaemic heart disease now seem clear, so much so that the Twenty-fourth World Health Assembly, in 1971, adopted a series of recommendations for individual and community action.²

As for the role of physical activity, it is difficult to add much to the hypothesis outlined by Morris et al. in 1953.³ We are still struggling with the problem of how to measure habitual physical activity and most of our knowledge is gained from the assessment of physical activity by exercise tests.^{4, 5, 6}

Apart from genetic factors, the beginning of atherosclerosis in childhood appears related to nutrition, dietary habits and to social environment. To assess the mental factors is difficult, because of the methodological problems involved in measuring characteristics of an individual in his social environment, the characteristics of our civilization, such as overcrowding, over-motorization, sedentary life behind the wheel of the car and in front of the television set, the ever-increasing speed of life, etc.⁷

¹ Cardiovascular epidemiology in the Pacific, Report of a WHO meeting of investigators in Wellington, New Zealand, 9-14 February 1970 (Int. doc. CVD/70.6)

² Health consequences of smoking, Resolutions and Decisions, World Health Assembly (WHA 24.48, 1971)

³ Morris, J.N. et al. (1953) Coronary heart disease and physical activity of work, Lancet, 2, 1053-1111

⁴ Assessment of habitual physical activity, Report of meeting of WHO temporary advisers, Prague, 1, 2 & 6 August 1971 (Int. doc. CVD/71.4)

⁵ Lange Andersen, et al. (1971) Fundamentals of exercise testing, WHO, Geneva

⁶ Exercise tests in relation to cardiovascular function (Wld Hlth Org. techn. Rep. Ser., 1968, No. 388)

⁷ Zanchetti, A., ed. (1972) Neural and psychological mechanisms in cardiovascular disease: proceedings of a symposium held in Stresa, 19-21 July 1971, Milan, Il Ponte

The problem of nutrition and dietary habits is, of course, related to a large extent to childhood, the malnourished child being recognized by caloric overnutrition. An elevated level of cholesterol and other lipids in the blood may, perhaps, be one of the biological parameters of this.

Most lipids in plasma are present as lipoproteins and hyperlipidaemia nearly always means elevated concentration of some lipoproteins. The most practical way of detecting hyperlipidaemia is to measure the concentration of cholesterol and triglycerides in the blood. It also provides some, but not all, information on the type of hyperlipoproteinaemia. A number of studies in recent years have revealed the need to classify hyperlipoproteinaemias for differential diagnosis of the genetically-determined defects in lipid metabolism, for differentiation of hyperlipoproteinaemias accompanying common diseases which promote atherosclerosis, for rational treatment of lipid disturbance, and to assist in the discovery of the causes and mechanisms of hyperlipidaemia. An internationally accepted simple classification should enhance knowledge of the distribution of the disturbances in lipid metabolism in different ethnic groups and environments.¹ Characteristics of plasma lipoproteins are assessed from concentration of serum cholesterol and triglyceride, from the presence or absence of chylomicrons and abnormal proteins and from estimation of low-density and very-low-density lipoproteins.

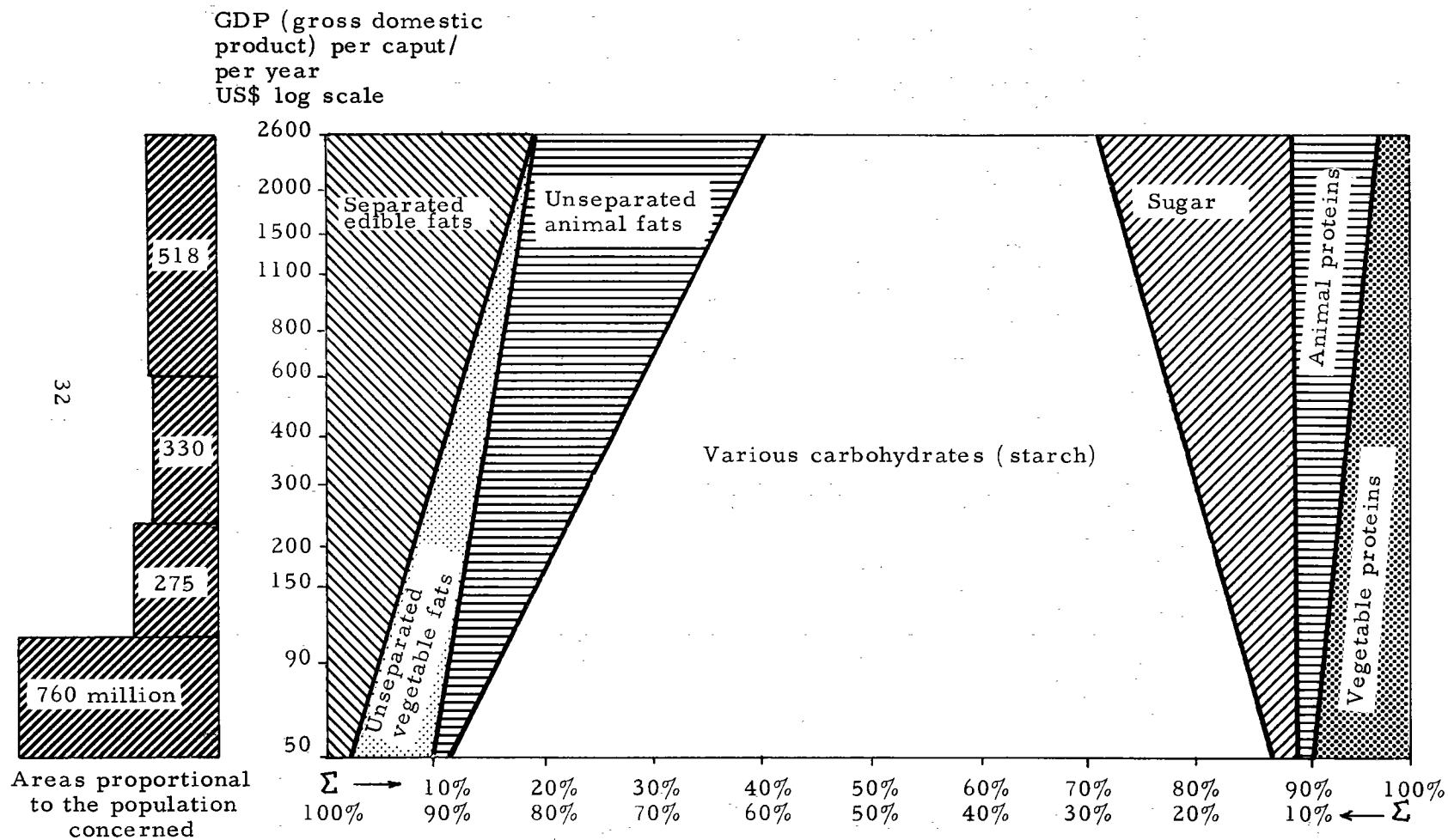
The worldwide changes in nutrition, as they were assessed cross-sectionally for 1962, in relation to the national income, was summed up by FAO on the basis of information from 85 countries (fig. 8).² It can be seen that with increasing national income there is an increased consumption of animal and "hard" fat, sucrose and animal proteins. The proportion of complex carbohydrate, vegetable proteins and fat decreases. Masironi³ has also found a similar correlation between mortality from ischaemic heart disease and the above factors. Information assembled from 38 countries shows a positive correlation between mortality from ischaemic heart disease and the total intake of calories, fat or fully saturated fat, sucrose, national income and energy consumption. There was a negative correlation with the consumption of complex carbohydrates, and there was practically no correlation with proteins.

¹ Beaumont, et al. (1970) Classification of hyperlipidaemia and hyperlipoproteinaemia (Bull. Wld Hlth Org., 43, 891-915)

² Provisional indicative world plan for agricultural development: a synthesis and analysis of factors relevant to world, regional and national agricultural development (FAO, 2, C69/4, August 1969)

³ Masironi, R. (1970) Dietary factors and coronary heart disease (Bull. Wld Hlth Org., 42, 103-114)

Fig. 8 Calories derived from fats, carbohydrates, proteins as percentage of total calories, according to the income of the countries (1962)



Correlation based on 84 countries

Evidence on the "sugar" hypothesis in the etiology of atherosclerosis is circumstantial and opinion is widely divided.^{1,2} The "lipid" hypothesis is still predominant.

Information from studies among 74 groups of people indicates a close linear correlation between the total caloric intake of fat, and the level of blood cholesterol. The relation between this level of cholesterol and ischaemic heart disease is different. Ischaemic heart disease begins to increase only where the average blood cholesterol level is higher than 200 mg/dl (fig. 9).¹ A similar correlation was found in autopsy material between atherosclerosis and the serum cholesterol level.³

A marked and consistent increase in calories, together with an increased percentage of fat and sugar, is paradoxically "balanced", not favourably, of course, with the diminishing physical activity. "Homo sedentarius" mobilizes his energy, as well as his catecholamines, by watching sport on television, by smoking and by consuming alcohol. This does not mean, of course, that a thin man of 40 who runs five kilometres daily would be the ideal; the example is meant only to stress that we have not adapted ourselves to rapid technical evolution; one can only deduce in a general way that ischaemic heart disease is a rather severe tax for the delay in the evolution of our knowledge concerning human health, and of our ecological systems in comparison with technological achievements. So far there are only a few indications that this balance is beginning to improve.

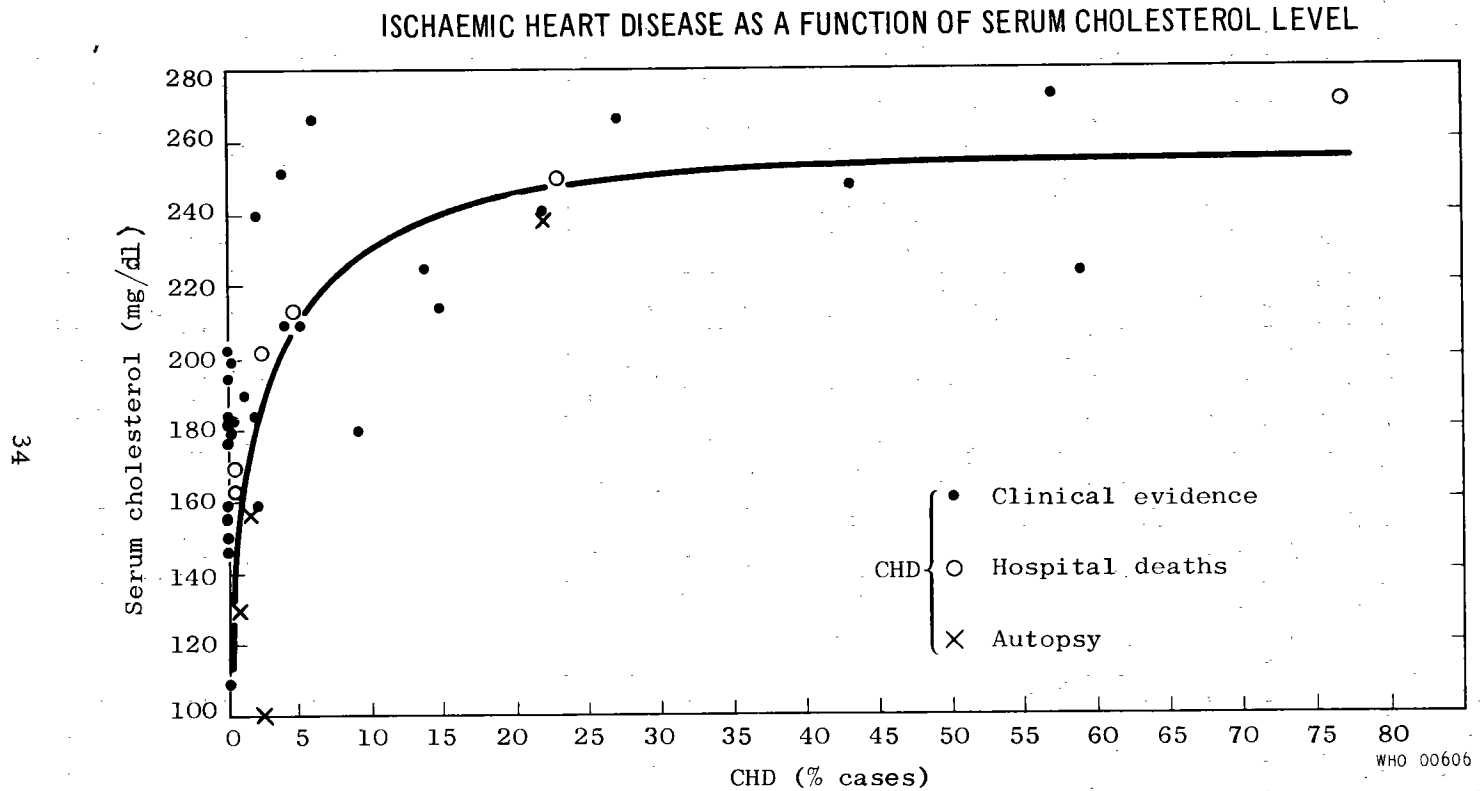
The risk of ischaemic heart disease is increasing with the number of predisposing factors; however, only about 5% - 10% of the middle-aged men in a study conducted in the USA have all three major "risk" factors, i. e., hypertension, hypercholesterolaemia and cigarette smoking. Although nearly one-third of them developed myocardial infarction within 10 years, this amounts only to 10% of all infarctions. In the predominant majority of subjects only one or two factors were present; these two

¹ Walker, A.R.P. (1971) Sugar intake and coronary heart disease, Atherosclerosis, 14, 137-152

² Fejfar, Z. & Masironi, R. (1971) Dietary factors and cardiovascular diseases - epidemiological studies in man. In: Proceedings of 3rd International Congress of Food Science and Technology, Washington D. C., 9-14 August 1970

³ Medical Research Council Working Party (1970) Dietary sugar intake in men with myocardial infarction, Lancet, 2, 1265-1271

Fig. 9



Source: Fejfar, Z. & Masironi, R. (1971) Dietary factors and cardiovascular diseases.
In: Proceedings of the Third International Congress of Food Science and Technology,
Washington, D.C , August 1970

groups contributed to four-fifths of all infarctions.¹ Data show that screening of adults may indicate individuals at high risk, but also that will cover only a part of those who will develop IHD.²

The above considerations lead one to conclude that preventive measures concerning ischaemic heart disease should ideally be applied to total populations and should start in childhood. They should be orientated towards proper nutrition and towards creating the most favourable environment for optimum physical and mental development of the child and adolescent. The whole problem, like most of the present problems of our society, is therefore that of the younger generation and should be the concern of paediatricians. However, long-term human studies, orientated in this way, do not exist. Preventive studies, multifactorial or unifactorial, which aim to influence the incidence of ischaemic heart disease by controlling one or more etiological factor, are all carried out in adults of middle age, and mainly or predominantly among men. Reduction of elevated blood pressure, blood cholesterol, or triglycerides, reduction of high intake of calories, particularly those from fat, and limitation or cessation of cigarette smoking, should decrease the problem of atherosclerosis and ischaemic heart disease, but will by no means result in the mass prevention of the condition. This requires further research into the etiology and pathogenesis of atherosclerosis, hypertension and ischaemic heart disease.

It is relatively easy to control the above abnormalities. However, except in cases of smoking withdrawal, no significant reduction of acute myocardial infarction has been proved from published primary prevention trials, although promising trends were reported in some (see table 3). Methodological aspects of the trials, the character of atherosclerosis and ischaemic heart disease and the type of prevention treatment may explain the negative results. In most published trials the number of subjects is small, the selection of the control and treated groups has not been done by randomization, and principles of a double-blind approach have not been followed. The trials, for practical reasons, start in middle-aged men, in whom coronary atherosclerosis often exists, and who also may have

¹ Epstein, F.H. (1970) The value of screening examination on identified high risk individuals in coronary heart disease prevention programmes. In: Ebrahim, M. & Newfeld, H.R., eds, *Cardiology, current topic and progress*, Symposia of the 4th Asian-Pacific Congress of Cardiology 1968, Jerusalem and Tel Aviv, Israel. New York/London, Academic Press, pp. 92-95

² Data from the "Pooling Project" in the USA (1970). In: Report of the Inter-Society Commission for Heart Disease Resources: Primary prevention of atherosclerotic diseases, *Circulation* A55-A85

Table 3

| Effect of intervention | | | | |
|------------------------|---|----------------------|---------|-------|
| Risk factors | | Athero- sclerosis | Infarct | Death |
| Cholesterol | + | } | + | + |
| Blood pressure | + | | ? | + |
| Smoking | + | | ? | + |
| Obesity | + | | ? | ? |
| Physical inactivity | + | | ? | ? |

scars in the myocardium from clinically "silent" myocardial infarctions. Furthermore, the prognostic significance of risk factors varies from culture to culture.¹

As we do not know the etiology or pathogenesis, our measures are limited to controlling some indicators of the disturbance in the circulating blood, such as elevated blood pressure. Nevertheless, the trials are an important step forward, showing that an active approach at a community level can be achieved, and their results point to the goals at which future efforts should be directed.

Since the etiology of ischaemic heart disease appears to be multifactorial, the multifactorial prevention approach is logical. Such studies, however, become very complicated and it is particularly difficult to differentiate between the more and the less important factors in a given population. The unifactorial trials are useful if they aim to test a certain hypothesis.

As increased levels of blood lipids appear to be the first biochemical abnormality in atherosclerosis, a double-blind preventive trial designed

¹ Keys, A. (1972) Quantitative estimation of risk. Abstract from paper presented at the Symposium on epidemiology of coronary heart disease, Helsinki, 23-25 March 1972. Scand. J. clin. Lab. Invest., 29, Suppl. 122, 17-18

to investigate the effect of reducing blood cholesterol in adults aged 30-59 years without manifest heart disease has been sponsored by WHO in Budapest, Edinburgh, London and Prague.¹

The trial started in Edinburgh in 1965 and was extended to Prague and Budapest in 1966 and 1967. Fifteen thousand men have been recruited from blood donors, population registers and other sources in the three centres. On the basis of a preliminary determination of serum cholesterol level, men in the upper third of the distribution curve of cholesterol values were assigned at random to a treated group, taking 1.6 g clofibrate daily, or to a control group taking identical capsules containing 300-500 mg olive oil. A second control group, chosen at random from the lowest third of the cholesterol distribution, also receives the olive oil capsules. The study is designed to provide a 90% chance of detecting, in the treated group, a reduction of one-third in incidence of ischaemic heart disease if this should occur. Subjects are examined initially, at six-monthly intervals for two years, and thereafter annually for the remainder of the five years for which the study is designed. Data are sent to London for processing and analysis.

Blood samples are tested for adherence to the drug. Incidence of ischaemic heart disease is defined in terms of myocardial infarction, sudden death and myocardial ischaemia. Suspected events are reviewed by an independent panel of specialists in cardiology. All subjects were admitted to the trial by 1971 and their characteristics are known, but it is too early to report any results in terms of infarction, ischaemia or death.

A multifactorial co-operative preventive trial sponsored by the WHO Regional Office for Europe has started in Brussels, London and Warsaw.

In 1969-1970 a WHO-sponsored study was conducted in Zagreb, Yugoslavia, to determine the feasibility of a long-term prophylactic treatment regimen. The aim was to investigate methodological problems relating to several behavioural and operational components in populations subjected to control of three "risk" factors for myocardial infarction and cerebral stroke, namely, elevated blood pressure, serum cholesterol and impaired glucose tolerance, using drugs. Experience gained in this study has been used in a larger investigation which has started in Rotterdam (Netherlands) and Kaunas (USSR), areas with markedly contrasting medical care systems. The target population is 4000 men aged 45-49 years in each city, and the study is well under way.²

¹ Heady, J. A., Primary prevention of ischaemic heart disease: An international trial on the effect of clofibrate, Bull. Wld Hlth Org. (in press)

² Annual Report of the Director-General for 1972, WHO, Geneva, 1973 (in press)

8. Existing possibilities

Diet is the basis of all preventive measures. Until recently it had been accepted that reduction of total calorie intake, so as to balance energy requirements, and reduction of fat intake, particularly animal saturated fat, should be sufficient. However, different types of disturbance of lipid metabolism which manifest themselves by, inter alia, the predominance of certain groups of circulating lipoproteins, require more specific and oriented dietary measures, supplemented, if necessary, by drugs. In a very schematic way, one may recommend a diet with low fat content in groups I, IIa and IIb. In subjects with lipoprotein types II, IV and V, carbohydrates should preferably be limited (see table 4).

Table 4

| Primary hyperlipidaemia | | | | | |
|-------------------------|-----------------------|----|----|--------|-------|
| Type | Lipoprotein | CH | TG | Action | |
| | | | | Diet | Drugs |
| I | Chylomicra | N | ++ | ■ | |
| IIa | LDLP | + | N | ■ | □ |
| IIb | VLDLP | + | + | ■ | □ |
| III | Abnormal | + | + | ■ | ▨ |
| IV | VLDLP | ± | ++ | ■ | ▨ |
| V | Chylomicra plus VLDLP | + | ++ | ■ | ▨ |

| | |
|----------------|-----------------------------|
| ■ Fat | ▨ Clofibrate Nicot. acid |
| ▨ Carbohydrate | □ Resin |

With regard to antilipaemic drugs, it seems that resins influencing absorption of fat from the intestine, such as cholestyramine, are preferable in subjects with a type II lipoprotein pattern, and clofibrate and nicotinic acid among types III, IV and V; clofibrate also in type IIb. In the rare type I, diet alone is sufficient.

Antilipaemic drugs are being developed more rapidly than the proper clinical evaluation of their therapeutic efficacy, tolerance and toxicity over long periods of time is taking place. Study of a small number of subjects for a few weeks will demonstrate the blood lipid reducing effect. On the other hand, acquiring proof of whether they will eventually reduce incidence of ischaemic heart disease in populations is a painstaking, complicated,

time-consuming and often frustrating work lasting several years. In this sense, one has to regard present population trials as pioneering work, paving the way for future preventive action covering the total community.

Activities urgently needed in order to promote the prevention of atherosclerosis, IHD and sudden death from IHD in populations, are schematized in table 5. Research into the etiology and mechanisms through which these conditions develop is the first priority. As atherosclerosis begins to appear in childhood, one should study the onset of the disease at that age, using the advantages of comparing differences between sexes, between children whose parents have suffered from IHD or atherosclerotic disorders, and of populations where atherosclerosis and IHD are still rare. Research investigations should work towards the next generation of preventive trials, which will be on a much larger scale and will have better methodology than the present ones. It should, in the next five to ten years, indicate the optimal nutrition, and the way to adapt the further development of our civilization in order to achieve harmonious physical and mental growth.

Table 5

| PREVENTIVE ACTIONS | | |
|--|--|--|
| POPULATION | E D U C A T I O N | |
| ATHEROSCLEROSIS LATENT IHD | SCREENING AND THERAPY OF PERSONS AT RISK | |
| ANGINA PECTORIS PRODROMATA ACUTE IHD | SERVICES FOR DIAGNOSIS AND THERAPY | |
| SUDDEN DEATH | | |

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Investigation of the role of an excess or a lack of certain minerals,¹ and of the effect of altitude hypoxia,² are part of the research programme promoted by WHO.

¹ Trace elements in relation to cardiovascular diseases: Report of a WHO/IAEA meeting of investigators, Geneva, 8-13 February 1971 (Int. doc. CVD/71.2)

² WHO meeting on the physiopathological and social medical problems of altitude, La Paz, 25-29 July 1972 (in press)

Screening of "healthy" subjects for coronary atherosclerosis and silent ischaemic heart disease, together with information gained from the medical history and the presence of predisposing factors, are useful for indicating which further investigations are needed before recommending the treatment. Coronary angiography is reserved for special situations, particularly when considering surgical intervention. The exercise stress test, with an increasing load up to submaximal aerobic working capacity, is being used more and more to assess the performance of the circulatory system. Symptoms and ECG signs of ischaemia are indicative of treatment, particularly in younger subjects.

It is now becoming more and more important to put every effort into increasing the physical and mental fitness of young people. Increased aerobic working capacity, with lower heart rate and blood pressure at the given workload, as compared with unfit persons, can place them on a higher level of health. This may be an important source to draw upon later during adult life, either in connexion with aging or on the occasion of a cardiovascular accident. It is much more difficult to alter the life habits of adults than to continue those which have become a part of daily routine since childhood. It could even be said that medicine is today paying a very heavy price for neglected education in the family and at school. Again, this is connected with ignorance on how to measure and promote optimal health.

9. International co-operation

The variations in incidence, natural history, severity and clinical manifestation of diseases in different societies, many of which are subjected to rapid transformation from a rural into an urban society, provide opportunities for studies on the cultural differences in dietary and other life habits which may help to clarify the etiology and suggest suitable preventive measures. The organizational structures of some societies allow for the mounting of preventive programmes which may then be modified and applied in other areas. Programmes on cardiovascular disease prevention and control depend on local resources, local organization of health services, local culture and education. An exchange of experiences in these fields would obviously be beneficial.

9.1 Communication

A communication programme corresponding to the immense and geometrically increasing amount of new information must therefore cover all sources, i. e., the entire world. The traditional channels of scientific communication, such as publications in scientific journals, or reporting at international congresses, have become too slow in comparison with the enormous expansion and speedy production of scientific work. Personal contact of people working in similar fields with the pre-circulation of unpublished material, the "invisible colleges" substituting for recognized international organizations or bilateral and multilateral exchanges between scientific institutions, do not suffice to cope with the volume of new results

and provide inadequate coverage of the interdisciplinary contacts. Thematic conferences or symposia with a limited number of participants are a very useful break in the long-distance race of scientific productions, providing a week for creative thinking and reflection, for critical review of past work and for the reappraisal of one's own ideas.

Universities, as centres for scientific research and education, are more orientated towards disciplines; they provide the necessary basic knowledge, with a smaller or greater time delay for its application in day-to-day medicine. International organizations, governmental and non-governmental, can ensure the direct communication and co-operation which were previously impossible. WHO seeks to achieve this by the exchange of information, training, the co-ordination of research and the rapid application of new knowledge in the community.

The tools for communication include the nomenclature and classification of diseases, methodology for population studies, the organization of international and regional technical meetings, together with a rapid publication of reports on the current status of the knowledge concerning etiology, treatment and prevention; the collection, storage and dissemination of scientific information on current cardiovascular research projects, on institutes and workers in the field of cardiovascular diseases.

9.2 Educational programmes

Knowledge of etiology, pathogenesis, prevention, treatment and rehabilitation is increasing more rapidly than the facilities for putting this knowledge to general use. The gulf is growing between the needs and the number of trained personnel, and their awareness of the problem. This results in the present situation, where possibilities for prevention, treatment and rehabilitation are offered to only a fraction of those in need. Lack of trained personnel, the passive attitude of many physicians and public health authorities who seem unaware of the existing possibilities, and ignorance on the part of the general public, are dominant among other reasons. Financial resources apparently play a minor role, although they are often said to be the main obstacle. The economic losses resulting from premature death and incapacity from cardiovascular diseases would seem to be far greater than the funds necessary for instituting the necessary community programmes, not to mention the ethical consideration that adequate care should be available to everybody.^{1, 2}

¹ US Department of Health, Education and Welfare, Public Health Service (1962) Economic costs of cardiovascular diseases and cancer, Washington (Health Economic Series, 5)

² Jeanneret, O. (1972) Les affections cardio-vasculaires, Les Cahiers Médico-Sociaux, 16, Nos. 1-2, pp. 8-20

The high level of technical proficiency of leading specialists in cardiovascular diseases all over the world, and of the many cardiologists, whether in specialized cardiovascular institutes or universities or in private practice, is well known. It contrasts sharply, however, with the insufficient appreciation of modern cardiology, particularly with regard to preventive measures, by many general practitioners, physicians, paediatricians, workers in departments of surgery, obstetrics and by those concerned with occupational health in general.

Cardiology has become an important speciality in medicine. Developments in medical technology, electrophysiology, haemodynamics, graphic techniques, radiology, metabolic aspects of heart diseases, and other factors which are necessary for furthering our knowledge, lead to further fragmentation within cardiology. This trend has not yet been compensated by the production of physicians who have an integral approach to the sick person as a whole and who use specialized techniques as a powerful extension of their observation abilities.

The large number of scientific journals on cardiology contrasts with the small number of those which deal with the progress and advances made in this field in a simple, concise way, understandable to a busy doctor who has insufficient time to devote to reading. Postgraduate training in cardiology depends in many cases on the goodwill of individual physicians.

National, international and continental cardiology congresses have grown to such proportions that it is becoming increasingly difficult to maintain personal contacts except with those working in a similar specialized field. The major role of congresses is becoming one of communication and postgraduate education, and the proceedings of such meetings may become the main source of up-to-date information on cardiology.

Programmes for continuing postgraduate training in cardiology at national levels exist in some countries, but there is no international or regional co-ordination or evaluation of such programmes.

In spite of the tremendous progress made in recent years, cardiology still remains, to a great extent, orientated towards diagnosis and the treatment of developed, established diseases in individuals. Control programmes for the whole community, prevention of cardiovascular diseases in individuals and on a mass scale, as well as the concept of improving health (physical, mental, and social) from birth, are only beginning to be accepted as means of preventing cardiovascular diseases.

Information and education of the general public is an integral part of any community programme. Unlike periodical vaccination and similar measures for preventing infectious diseases, attempts to improve health by changing traditional, nutritional and other life habits need to be pursued continuously. The co-operation of health workers, educators, sociologists, and the public at large, and the use of all methods of communication, are essential if an impact is to be made. While specific features of national

and cultural backgrounds must be taken into account, there is scope for general principles to be outlined in journals with international distribution. WHO periodicals,¹ "Around the World with WHO" radio programmes and the production and exchange of medical films have all proved useful in spreading knowledge about cardiovascular diseases.

9.3 Co-operative studies

The preceding remarks have indicated conditions that could be well controlled if available means were applied and made available to everybody. This could and should be achieved by using, in the most effective way, the existing health services. In order to prove to what extent and in what manner the control of cardiovascular diseases can now be controlled at the community level, a number of pilot studies, promoted and co-ordinated by WHO, are under way. They include measures for the prevention of rheumatic fever (see page 26), the control of hypertension and stroke (page 32) and the early diagnosis, care and rehabilitation of patients with acute myocardial infarction. The latter study has been carried out in 16 areas of Europe, one area in Australia and one in Israel. The arrangements for this activity are envisaged as the basis for similar cardiovascular disease control programmes mentioned previously. Eventually, all these should be combined in a control programme which will form part of the national health services. In principle, the integration of hospital services with those of practising physicians, district health centres (rural or urban) and occupational health centres can be applied to every kind of basic health service structure (fig. 10).

Unlike the majority of infectious and parasitic diseases, only some cardiovascular diseases can be prevented at present. Several, however, can be well controlled, although this has so far not been achieved in most countries at a community level. Strategy should therefore include several approaches.

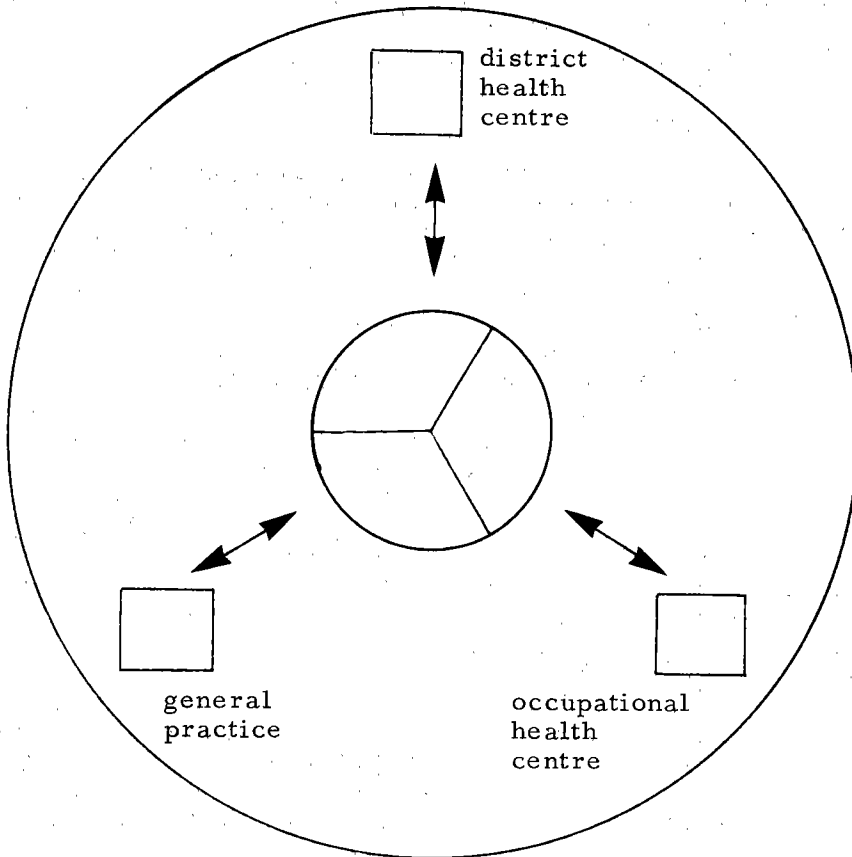
Operational research on health care delivery in areas varying in socio-economic structure should ensure that care is available to everyone in need.

The most outstanding unsolved problem is coronary atherosclerosis resulting in ischaemic heart disease. Other common conditions, such as carbohydrate intolerance leading to diabetes or hypertension are regarded as conditions aggravating atherogenesis. The control of atherosclerosis is therefore a matter of top priority for mobilizing worldwide co-operation. Atherosclerosis cannot yet be prevented and efforts should be directed towards research into the etiology and pathogenic mechanisms of atherosclerosis and ischaemic heart disease. Epidemiological studies have indicated areas and groups of people with much or little disease in relation to predisposing factors. They are often in countries where in-depth studies

¹ World Health, editions June-July 1965, November 1969, August-September 1970, February-March 1972

Fig. 10

SCHEME FOR THE ORGANIZATION OF
MEDICAL SERVICES IN THE COMMUNITY



Source: Les affections cardio-vasculaires: Les Cahiers Médico-Sociaux,
16, 1-2 (1972)

into the mechanisms cannot be made without outside help. The wealth of research potential in highly developed societies should be used to test in laboratory experiments the indications from clinical and epidemiological observations.

On the other hand, possibilities for prevention need to be tested in population studies carried out on a large scale in subjects without chronic disease, and with adequate methodology.

For particular research tasks, and to avoid multiplication of effort, a worldwide network of research and training centres is needed. These should continue to be selected according to the particular contribution they are likely to make. Selection and co-ordination of their work should be done by WHO. Previous experience has shown that such centres are very productive. Their number is still relatively small in comparison with the problem and the possibilities which exist.

One other important aspect needs to be emphasized. Although most cardiovascular diseases are manifested or begin during childhood and adolescence, this particular feature in aging subjects should not be neglected. Fig. 11 shows how appreciable now is the proportion of the population over 60 years of age, and with the increasing possibility for the control of cardiovascular diseases this percentage will grow still larger.

Analysis of life tables for 35 countries indicates how much the expectation of life could be changed if certain important causes could be eliminated.¹ Fig. 12 shows clearly that by far the greatest prolongation would occur if one could control and prevent all cardiovascular diseases. The average life span would then approach 75-80 years, or more. This would mean that a considerable proportion of the population would pass beyond the age of obligatory retirement. The social aspects of cardiovascular diseases are thus becoming very evident. The logical consequence is that one should consider, hand in hand with preventive actions, the whole complex of care for the aging population, including keeping them actively integrated in society. Diseases have indeed to be considered at both ends of life in the context of society. We have to learn how to feed and raise children using the beneficial achievements and eliminating the unfavourable consequences of man-made civilization. The medical and social aspects of health should equally be used for the benefit of young and old. We accept technical progress as self-evident and often make use of it, not considering its effect on health. When we can regard as equal priorities our research into the biology of man in his civilization, and the building up of measures for the development and maintenance of optimum health, the problem of cardiovascular diseases will rapidly diminish and our civilization will begin to become human.

The problem of CVD is universal and complex. It would therefore be solved more quickly if the attack were directed from several angles. A multidisciplinary scientific approach, co-operation between governmental and other organizations in different cultural, social and political settings, and co-operation between the expert scientists and the population at large is essential. WHO has the opportunity for, and is ready to undertake the responsibility for, such worldwide co-operation.

¹ World Health Statistics Report, 25, No. 5, pp. 430-442, 1972

Fig. 11 CZECHOSLOVAKIA - AGE DISTRIBUTION OF POPULATION IN PERCENTAGES

Projection until the year 2000 is based on the present mortality ratio

46

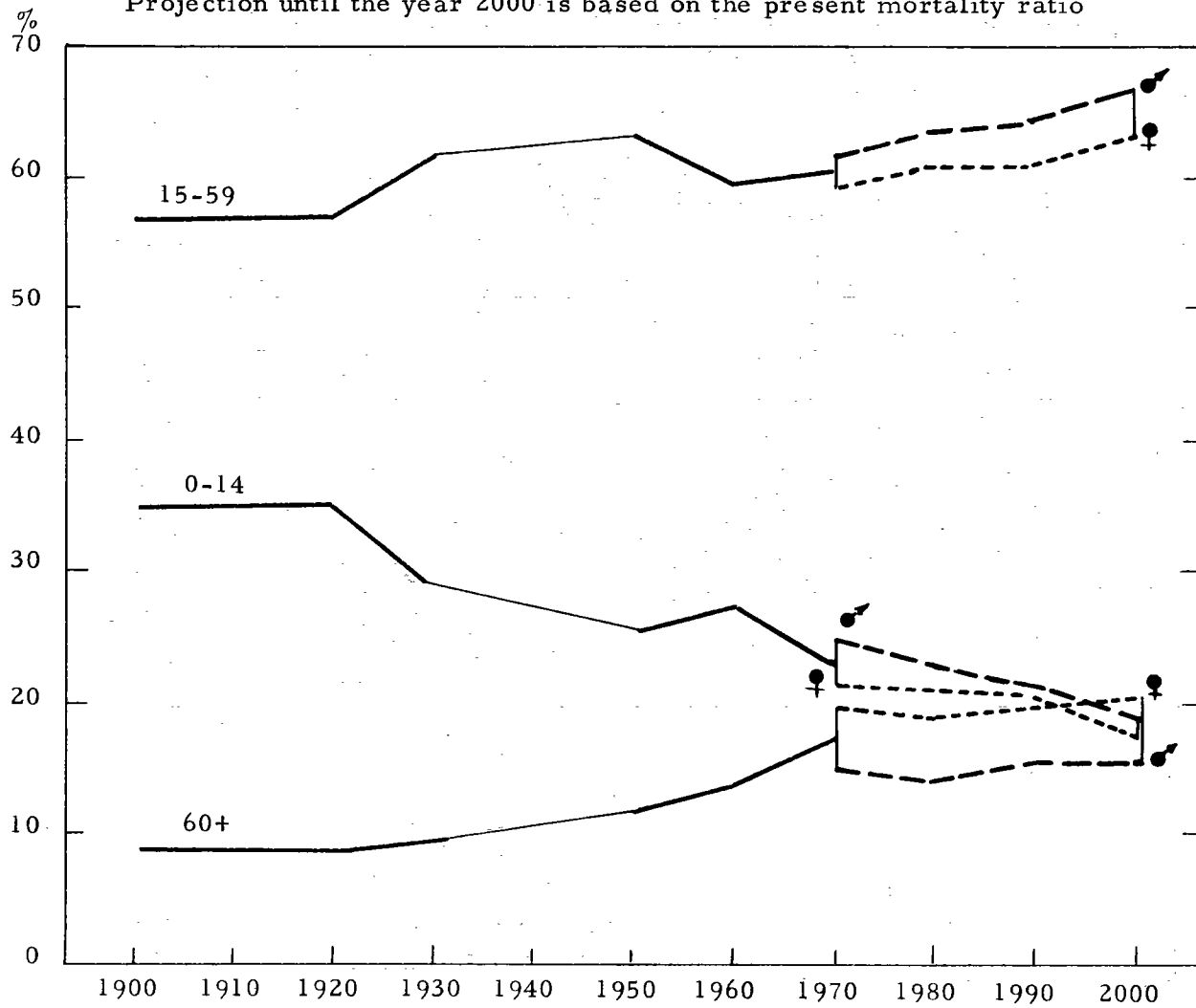
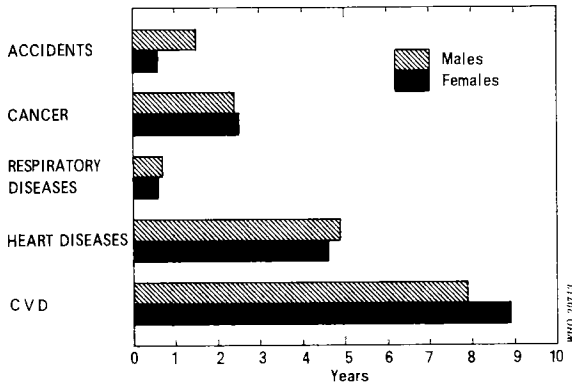


Fig. 12

PROLONGATION OF LIFE IN YEARS, AT AGE 5, EXCLUDING SOME CAUSES OF DEATH,
25 COUNTRIES, 1967



World Health Stat. Rep. 25, 430-439, 1972