The Older Dockworker

evaluation and follow-up of a screening program

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aan JAN, JO
en JOSÉ

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Contents

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Abbreviations

BGD	:	Bedrijfsgeneeskundige Dienst (Occupational Health Service)
BMI	:	Body Mass Index
BSR	:	Blood Sedimentation Rate
CHD	:	Coronary Heart Disease
CO	:	Carbonmonoxyde
COPIH	:	Commissie Opsporing en Preventie Ischaemische Hartziekten — (Committee for Detection and Prevention of Ischemic Heart diseases)
CVA	:	Cerebrovascular Accident
CVD	:	Cardiovascular Diseases
e.g.	:	exemply gratia
et al.	:	et alii
etc.	:	etcetera
$FEV_{1\ sec.}$	:	Forced Expiratory Volume in 1 second
$FEV_{5\ sec.}$	:	Forced Expiratory Volume in 5 seconds
GTT	:	Glucose Tolerance Test
Hb	:	Haemoglobin
IHD	:	Ischemic Heart Disease
incl.	:	inclusive
IVGTT	:	Intravenous Glucose Tolerance Test
LAH	:	Left Anterior Hemiblock
LBBB	:	Left Bundlebrach Block
NVAB	:	Nederlandse Vereniging voor Arbeids- en Bedrijfsgeneeskunde (Dutch Association for Labour and Industrial Medicine)
OGTT	:	Oral Glucose Tolerance Test
OHS	:	Occupational Health Service
PEF	:	Peak Expiratory Flow rate
RBBB	:	Right Bundlebrach Block
RDA	:	Rate Dependent Aberrancy
VC	:	Vital Capacity
WHO	:	World Health Organization

Chapter I

Synopsis of this investigation

completely ineffective. Reasons for these two major findings are discussed in chapter VII. The literature survey and the data from this study indicate further that the glucose tolerance and the exercise-ECG are of little significance for mass screening. In fact great caution appears necessary in advising patients about the possibility of the existence of coronary artery disease (CAD) when during a single exercise test ST-segment abnormalities are found in asymptomatic individuals. Most of the data collected during the visits to the general practitioners also show that the physicians in general were not well informed about the need for prevention and were not well equipped to deal with data obtained from this screening program.

In the final chapter (VIII) the conclusions of the study are given. They can be summarized by the statement that only three risk indicators are at present amenable for the prevention of CAD. These are hypertension, (cigarette) smoking and hypercholesterolemia. Since it is also evident that, until the present, there is no mass screening test available to detect presymptomatic CAD, a major effort should be mounted to reduce the prevalence of the three major risk indicators. In view of the highly disappointing performance of the existing medical system various ways and means to improve the situation are suggested.

Chapter II

Literature survey

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2.1 Introduction

The basis of medical action is often formed by experience achieved from the examination of groups. This data supply information for epidemiology, which in turn can be made subservient to the individual patient. Research in the field of the occurrence of cardiovascular diseases demonstrated large differences in frequency between various (sub)populations. In order to explain this phenomenon and to achieve possible prevention, characteristics have been looked for in which the populations with a high frequency of cardiovascular diseases discern themselves from populations with a low frequency.

In the course of the years many of these characteristics have been described. "Coronary risk factors are those habits, traits and abnormalities associated with sizeable (100% or more) increase in susceptibility to premature coronary heart disease" (Froelicher, 1972). It is not necessary that the risk indicators have direct causal connection with cardiovascular diseases. The significance of a risk indicator not only depends on the nature, but also on the extent to which it deviates from the standard. As major risk indicators are considered: high blood pressure, smoking and an increased cholesterol level of the blood (Stamler, 1970; Froelicher, 1972; Blackburn, 1974; May, 1974). Other items mentioned are a disturbed sugar metabolism, overweight, physical inactivity, personality structure, behaviour and stress, heredity, age, sex and race (Froelicher, 1972). A number of these risk indicators, such as blood pressure, cholesterol level and smoking are of direct preventive medical interest, because they can be influenced. After identification of these risk indicators it has been tried to push back the occurrence of cardiovascular diseases by means of influencing the risk indicators.

This literature survey does not pretend to supply an exhaustive rundown of the study results, opinions (and petty opinions) related to the above mentioned set of problems, but must be considered as a supplement to the research by Baart (1973). Results of this analysis are described for each risk indicator.

2.2 Screening

The large scale identification of people with increased chances of sustaining cardiovascular diseases is often realised by means of screening (Stamler, 1968; Rosenman, 1970; Schoenberger, 1972; Wilber, 1972; Baart, 1973; Hinkle, 1973; Charman, 1974; May, 1974). After a literature study, Whitby (1974) describes definitions and criteria which must be met by screening programs. "Screening is defined as the presumptive identification of unrecognized disease

or defect by the application of tests, examinations or other procedures which can be applied rapidly". Screening can be effected with large population groups (mass screening) or with certain subgroups (selective screening), it can be focussed on one single defect or on many defects (multiphasic screening). Examination methods have to be applied for screening programs with which it is possible to sort out apparently well persons who have a disease from those who probably do not. In principle these tests — effected without clinical indication — do not have to have diagnostic value per se.

When the results of the tests are being interpreted the concepts validity, sensitivity and specificity must play an essential part. The validity of a screening test is defined as the frequency with which the results of the test were later confirmed by an acceptable diagnostic procedure and the sensitivity as the ability of a test to give a positive finding when the person tested truly has the disease under study. The specificity is the ability of a test to give a negative finding when the person tested is free of the disease under study. Combinations between sensitivity and specificity of screening tests have to be seen as compromise solutions in practice.

The result of a screening test is either normal or abnormal. The normal group consists of: 1. "true negatives" (test negative and no disease) and 2. "false negatives" (test negative, disease).
The abnormal group consists of: 1. "true positives" (test positive, disease) and 2. "false positives" (test positive, no disease).
"The sensitivity of a screening test can be set at such a level that it always gives a positive result when disease is present (100% sensitivity, no false negatives) but this will inevitably be at the expense of loss of specificity due to the selection of false positives. Alternatively, the specificity can be raised but usually at the expense or loss of sensitivity and the appearance of false negatives.
Whitby's article (1974) again summarizes the "principles of early disease detection as formulated by Wilson and Jungner". (W.H.O. 1968).

1. "the condition being sought should be an important health problem, for the individual and the community";
2. "there should be an acceptable form of treatment for patients with recognisable disease";
3. "the natural history of the condition, including its development from latent to declared disease, should be adequately understood";
4. "there should be a recognisable latent or early symptomatic stage";
5. "there should be a suitable screening test or examination for detecting the disease at the latent or early symptomatic stage, and this test should be acceptable to the population";
6. "the facilities required for diagnosis and treatment of patients revealed by the screening programme should be available";
7. "there should be an agreed policy on whom to treat as patients";
8. "treatment at the presymptomatic, borderline stage of a disease should favourably influence its course and prognosis";
9. "the cost of case-finding (which would include the cost of diagnosis and treatment) needs to be economically balanced in relation to possible expenditure on medical care as a whole";
10. "case-finding should be a continuing process, not a "once and for all" project".

2.3 The arterial blood pressure

The sphygmomanometer, introduced some 70 years ago by Riva-Rocci, is often used for measuring the arterial blood pressure. This method of blood pressure determination involves many drawbacks. One of them is the inaccuracy of the instrument, which issues from technical error sources — both diastolic and systolic pressure may have an error of plus or minus 8 mm Hg — the influence of arrhythm and tachypnea and the position and size of the arm (Page, 1972). Other variable error sources are the time that has elapsed between the latest meal and the measurement with which the person is to be examined, his consumption of tobacco, the state of micturation, pain, excitement, the pressure of the cuff and the climate. The level of the blood pressure is also influenced by the day and night rhythm (Page, 1972).

The measuring point of the diastolic blood pressure is a major source of confusion. Both the muffling (phase IV) and the disappearance (phase V) of the Korotkoff sounds are advised. Phase IV is 7 to 10 mm Hg above the direct diastolic blood pressure, measured intra-arterially, phase V generally corresponds with the intra-arterial pressure. The American Heart Association recommends phase IV as the best index for the diastolic blood pressure. An important part is also played by the accuracy with which the observer reads the blood pressure (Page, 1972).

Many large-scale epidemiologic studies have demonstrated that high blood pressure strongly increases the chances of contracting cardiovascular diseases (Stamler, 1970; Blackburn, 1974). As the Atherosclerosis Study Group (Stamler, 1970) puts it: "this relationship between blood pressure and cardiovascular heart disease risk is continuous. At each higher step of the blood pressure scale risk is increased. Hypertension has also been established as a major risk indicator for cerebrovascular disease, including atherothrombotic cerebral infarction and cerebral hemorrhage."
This knowledge, coupled to the fact that hypertension occurs with a great many adults and is often known by the sufferer, makes prevention of this disease, within the scope of the fight against cardiovascular diseases, of extreme importance.

Schoenberger et al. (1972) find with an industrial population (N = 22, 929) 11.8 per cent of people with high blood pressure (systolic blood pressure $\geqslant$ 160 mm Hg and/or diastolic blood pressure $\geqslant$ 95 mm Hg) measured in recumbent position.
Reid et al. (1974) have diagnosed hypertension (systolic blood pressure $>$ 200 mm Hg or diastolic blood pressure $>$ 115 mm Hg) in the age group 40-64 years (N = 18,403) in 3.2 per cent of the cases.
Wilber et al. (1972) observed in 6,012 persons of 15 years and over (95 per cent negroes) in 28.5 per cent of the cases hypertension (hypertension: systolic blood pressure $\geqslant$ 160 mm Hg and/or diastolic blood pressure $\geqslant$ 95 mm Hg).

Lew (1973) provides imposing figures obtained from life insurance companies. The blood pressure for an optimal life expectancy is systolically less than 110 mm Hg and diastolically less than 70 mm Hg. In the U.S.A. 20.2 percent of the

Caucasian male population in the age group of 55-64 years have a systolic blood pressure over 160 mm Hg or a diastolic blood pressure over 95 mm Hg.
Borderline hypertension (blood pressure ranging between 140/90 mm Hg and 160/95 mm Hg) occurs in 28.4 per cent of the cases. A systolic blood pressure of 178 mm Hg or over combined with a diastolic pressure of 108 mm Hg or over shows a mortality rate of about 60 per cent. A blood pressure of 140/90 mm Hg with men over forty is attended by an extra mortality of 45 per cent.
In The Netherlands there are also a great number of people with hypertension. De Soto-Hartgrink (1968) found with civil servants (40-49 years) in 41 per cent of the cases a blood pressure $\geqslant$ 160 mm Hg systolically and/or $\geqslant$ 95 mm Hg diastolically (phase IV). A research by May (1974) in the village of Vlagtwedde demonstrated that these values occur in 18 per cent of the determinations in this age group.

The Veterans Administration Co-operative Study Group on Antihypertensive Agents (1967, 1970) has shown that effective treatment of patients with hypertension is possible. A group of 143 male hypertension patients (diastolic blood pressure 115-129 mm Hg, age between 40 and 60 years) have been treated in a stringent program at random, with drugs or with a placebo. In the placebo group occurred 27 serious complications against 2 in the medically treated group. The examination, started in April 1964, was stopped in the blood pressure group of 115-129 mm Hg diastolic in December 1966. The study was terminated in the 115 mm Hg and higher group at an earlier date than expected when it became apparent that the risk rate increased sharply at these levels of diastolic blood pressure and that the clinical course of such patients appeared to be favourably influenced by antihypertensive drug treatment. Also in the group of people with a diastolic blood pressure between 90 and 114 mm Hg, included in this study, a beneficial effect of antihypertensive treatment has been observed. The estimated risk of developing a morbid event over a five year period was reduced from 55% to 18% by treatment. The degree of benefit was related to the level of prerandomization blood pressure. It is pointed out that the examination was performed with a strictly selected group. However, this does not alter the fact that promising information has been made available in order to achieve an effective fight against the "silent killer": hypertension. Indeed since this information has come available much more attention has been paid to the detection of patients with hypertension.

Wood et al. (1971) published "Guidelines for the Detection, Diagnosis and Management of Hypertensive Patients", Wilber et al. (1972 a) "High Blood Pressure Program Methods of Community Hypertension Screening", Wilber et al. (1972 b) "Hypertension — a Community Problem" and Charman (1974) "Hypertension Management Program in an Industrial Community".

According to Wood et al. (1971) there are two possible methods of approach to trace patients with hypertension, the incidental screening and the organized community screening. After screening care must be taken of the diagnostic evaluation and, where necessary, of effective therapy.
Wilber (1972 a; 1972 b) says on the basis of his data: "It is suggested that community screening programs combined with simplified diagnostic evaluation and intense patient education and follow-up greatly increase the percentages under continuous treatment and control". It appears that the aftercare of the hypertension patients, once he has been traced, is miserable. "In this community, for each 100 persons screened, twentyfive will be hypertensive,

sixteen will reach a physician for diagnosis and treatment, eight will continue treatment and four will achieve blood pressure control for at least one year".
During Wilber's study a number of methods have been tested to reach a major part of the populations. Invitations for an examination of the blood pressure via mass media and via letters to families only resulted in an attendance percentage of about 10 per cent. The greatest success has been scored by door to door visits and with mobile examination facilities in busy shopping streets. However, both methods have their obvious disadvantages.
Charman (1974) describes a study concerning the occurrence of hypertension in the employees of two factories. A total of 2,672 people were invited by letter for an examination; attendance amounted to 55 per cent. The refusers were then approached by telephone which resulted in a total attendance of 63 per cent. A second request by telephone did not decrease the number of refusers (86.8 per cent remained not interested; 5.4 per cent were not able to come at short notice; 7.8 per cent were already under medical treatment). A striking aspect of this study is the high percentage of participants (96.8 per cent) that co-operated in a further evaluation of the high blood pressure. After one year 86 per cent of the participants with a diastolic blood pressure over 100 mm Hg were still scheduled for drug therapy.
Schoenberger et al. (1972) find 2,725 people with hypertension among the 22,929 people examined. "Prior knowledge of the diagnosis was denied by 58.9% of the cases. Of the remaining 41.1% giving a history of hypertension about 40% were not currently receiving treatment when surveyed, and about another third were being treated but were still hypertensive. Only about a quarter of these known hypertensives (representing only 11.2% of all the identified hypertensives) were having treatment with resultant reduction of blood pressure to levels below 160-190 mm Hg".

The European Working Party on High Blood Pressure in Elderly Patients (Amery, 1975; Birkenhäger, 1975) tries to give an answer to the question "Should elderly hypertensives be treated?". "In this study workers from 5 European countries designed a trial in which patients over 60 with mild to moderate hypertension are allocated at random into either a group treated with placebo or a group treated with antihypertensive drugs and followed under double-blind conditions. A one year study is completed and has shown that a multinational study is possible and that a significant reduction in blood pressure can be achieved in the active treatment group without major side-effects. In this pilot study no significant differences in the 140 patients in cardiovascular events have been observed".

2.4 Smoking

The deliberate strong pollution of inhaled air by the smoke of burning tobacco is a widespread habit. In The Netherlands 40-45 per cent of the boys and girls in the age of 13-18 years are now smoking cigarettes, at the age of 19-23, 70% and over 60% respectively. With men this percentage remains on the same level until the age of 50 (De Haas, 1973). In the U.S.A. these figures are 41.3% for men in the age group of 17-24 years, for women 29.4%, for the group 24-44 years this is 54.7%, 40.2% respectively (Lew, 1973).

Tobacco smoke contains a great number of chemicals. The smoke can be divided in a gas phase (92% of the smoke) and a particle phase (8%) (Neukomm, 1974). Some of the chemicals are poisonous to a certain degree: carbonmonoxyde strongly decreases the oxygen transport capacity of the red blood-corpuscles, nicotine influences the nervous system and a number of tar products are causing cancer. The latter are left out of consideration within the scope of this review.

Tobacco smoke contains some 4% of carbonmonoxyde (Wald, 1973). After inhalation the carbonmonoxyde combines with the haemoglobin (Hb) in the red blood corpuscles. The percentage of Hb combined with CO (HbCO) is a standard for CO poisoning. With heavy smokers this percentage can soar to 15. Not more than 2.5% HbCO can be ascribed to atmospheric CO. The prognostic significance of a high HbCO percentage is impressive. "In the age group 30-69 years a person with a HbCO level of 5% or more was found to be 21 times as likely to be effected by atherosclerotic diseases including ischemic heart disease (IHD) as another person of the same age and sex with similar smoking history and current smoking habits but with a HbCO level of less than 3% (Wald, 1973)."

From experiments with laboratory animals it appears that the carbonmonoxyde increases the permeability of the vascular wall from which accelerated atherosclerosis will occur (Astrup, 1974). With human beings the occurrence of heart failure and mortality as a consequence of coronary heart disease (CHD) appears to be significantly higher with heavy cigarette smokers than with light cigarette smokers (Aronow, 1974). The smoking pleasure depends on the nicotine level in the blood (Neukomm, 1974). The number of cigarettes necessary to obtain the desired blood level is decided by the nicotine percentage of the tobacco. The lower the nicotine percentage, the higher the number of cigarettes needed. However, this entails an increase of the quantity of carbonmonoxyde inhaled (Russell, 1974). Nicotine increases the systolic blood pressure and the cardiac frequency. This causes a higher oxygen demand on the heart. As the blood not only assimilates the nicotine but also carbonmonoxyde, this decreases the quantity of oxygen available for the body. Thus smoking fosters an oxygen shortage by various mechanisms (Aronow, 1974). The advice to stop smoking cigarettes and to change to smoking a pipe seems rather senseless because ex-cigarette smokers generally also inhale the pipe tobacco smoke and thus again absorb carbonmonoxyde in the blood (Castleden, 1973).

The mortality as a consequence of CHD decreases when smoking has stopped. The CHD rates of ex-cigarette smokers are below that of smokers (Stamler, 1970; Doll, 1974). With younger people this difference is greater than with middleaged men (Stamler, 1970).

It has never been proven that smoking has any favourable aspect (Blackburn, 1974), but it appears to be very difficult to break with the habit. In a follow-up study with 125 heart attack patients who had been frequently advised to stop smoking, 62 per cent appeared to have stopped smoking after 1-3 years, with a comparable group of 85 persons who had not frequently been advised to do so, this percentage amounted to 27.5.

Russell (1974) tries to give a recommendation to achieve a decreased consumption of cigarettes. "With the combined effect of health education coupled by selective taxation to the powerful price disincentive, it should be possible gradually to phase out dangerous cigarette smoking in favour of acceptably safe, light to moderate, controlled, non-inhaled smoking of pipes or medium to large-sized cigars".

2.5 Cholesterol

There have been several studies concerning the serum cholesterol level of various populations. When the results are compared, the study method used must be taken into account when the data are interpreted as the determination of the cholesterol can be realised both in plasma and in serum. The determination in serum must be preferred in connection with great and inconstant differences between plasma cholesterol values and constant serum cholesterol results (Boerma, 1974).
During a comparative study of the cholesterol level in the serum of Australians and natives on New Guinea (Whyte, 1958) it appeared that in newly born babies the serum cholesterol level of umbilical cord blood was the same with both groups. After one year this had doubled with both groups. After that the serum cholesterol level of the Australians continued to increase whereas that of the natives fell gradually to adult levels (130 mg%). Comparable results have been achieved by a study among Indians in Surinam, living under primitive conditions (Geerdink, 1973). With all age groups the cholesterol level is rather constant and averages 137 mg per 100 ml of serum. These values differ markedly with those found in countries with high mortality and morbidity of cardio-vascular diseases (table 2.1) (Kannel, 1971; Goldstein, 1973).

Table 2.1
Serum cholesterol concentrations of various populations (mg%).

1) 4-10 years
2) 16-19 years
3) 30-50 years
4) 65-75 years

Years	0-10	10-20	20-30	30-40	40-50	50-60	> 60
New Guinea natives (Whyte, 1958)	126	128	130	—	—	—	—
Surinam Indians (Geerdink, 1973)	137	133	134	136	147	136	138
Tecumseh (Johnson, 1965)	178 [1]	172	189	208	225	239	255
Vlagtwedde (May, 1974)	—	—	234	260	269	—	—
Dutch men (De Wijn, 1972)	—	171 [2]	192	231 [3]	231 [3]	—	255 [4]
Finnish men (Karvonen, 1959)	—	—	208	242	248	250	—

In the U.S.A. the average cholesterol level of fifty years old men amounts to about 250 mg/100 ml of serum, 26 per cent have a percentage of 260 mg% or over and 5 per cent have 300 mg% or over (Wynder, 1972; Lew, 1973, annex 10). Cardiovascular diseases occur very frequently in these Americans, contrary to Japanese who have an average cholesterol percentage under 180 mg%. This introduces the question: "Blood lipids: How normal is normal?", posed by Wynder et al. (1972). When the question was posed to a number of experts in the field of atherosclerosis, which levels they consider normal cholesterol levels, 146, 174 and 185 mg% respectively for 10, 30 and 50 years old were suggested as normal levels. The Framingham Study (Higgins, 1965) gives an incidence rate of 9.7 per 1000 of cardiovacular diseases with men with a serum cholesterol level of 220 mg% and for cerebrovascular accident (CVA) of 2.3. With a serum cholesterol percentage of 280 mg% or over these are 22.1 and 3.1.
These figures correspond with those of The National Co-operative Pooling Project (Lew, 1973). In this project Caucasian males in the age group of 30-59 years with a serum cholesterol of 300 mg% or over were found to have an incidence of first major coronary events that is about three times that for men with serum cholesterol levels of 175 to 224 mg%.

Although no solid, conclusive evidence has been obtained, there are indications that modification of the diet which decreases the cholesterol level of the blood, will decrease also the occurrence of coronary heart disease (CHD), if only in the short term (Stamler, 1970; Miettinen, 1972; Evans, 1972; Blackburn, 1974). It appears that the effect of the cholesterol decreasing diet depends on the initial value of the cholesterol percentage. According to Ederer (1972) this can be explained with two hypotheses: the diet-hypothesis and the regression-hypothesis. The diet-hypothesis presumes that an initial high serum cholesterol percentage will be influenced more by cholesterol decreasing diets than a low cholesterol percentage. The regression-hypothesis assumes that, independent of the diet intervention the higher serum cholesterol values generally decrease at a faster rate (or increase at a reduced rate) than lower values. The two hypotheses do not negate each other and both principles appear to be of importance.

Apart from the positive correlation between the blood cholesterol percentage and CHD, the inverse correlation between the serum cholesterol percentage and colon carcinoma has been outstanding (Rose, 1974). These data necessitate "further study of the relation in individuals between carcinogenproducing faecal bacteria and the dietary intake of polyunsaturated fat and fibre" (Rose, 1974).
Blackburn rejects determination of the triglyceride percentage of the blood as risk indicator. "For the general population outside hospitals, there is no evidence that triglyceride levels contribute information on CHD risk, which is independent of the associated serum cholesterol level" (Blackburn, 1974).

2.6 Glucose tolerance

The significance of adult-onset diabetes mellitus as a risk indicator for the contraction of cardiovascular diseases is not yet clear (Blackburn, 1974). This is caused to a large extent by the fact that no well defined predictive screening criteria concerning diabetes mellitus are available. Many different criteria are being used in the literature, which makes it a rather precarious undertaking to compare the studies with each other (annex 1).

The items generally used in epidemiologic studies as screening tests are: the determination of the glucose percentage of the blood, the glucose percentage of the urine or a combination of the two determinations. The blood can be taken by needle directly from a vein (venous blood) or via a stab in the earlobe or fingertip (capillary blood). The determination can be effected in venous or capillary blood, but also in plasma or serum. The concentrations determined are depending on the medium in which they have been determined and on the method followed for their determination. Often employed methods are: the reduction of ferricyanide to ferrocyanide under the influence of glucose, copper (II) to copper (III) ions, or the direct coloration with O-toluidine. Enzymatic determinations must also be included (Boerma, 1974).

The investigation of blood and urine can be effected after a period of fasting (the fasting examination) or at a certain time after a meal. The glucose percentage of the blood can also be determined after administration of an overdose of glucose. This method of examination is called the Glucose Tolerance Test (G.T.T.). The glucose can be administered orally (Oral Glucose Tolerance Test: O.G.T.T.) or directly into the vascular system (Intravenous G.T.T.: I.V.G.T.T.).

At national and international levels attempts have been made to issue directives in order to define diabetes mellitus (World Health Organization, 1965; Fajans, 1974) and to standardize the G.T.T. Notably much attention has been paid to the uniform way of preparation of a patient (fasting or not fasting) the way and site of tapping the blood (venous, capillary), the time schedule of the glucose tolerance test and the interpretation of the examination results (Klimt, 1968; Teuscher, 1971).

In 1965 a World Health Organization report (W.H.O., 1965) included definitions of potential diabetics, latent diabetics, asymptomatic diabetics and clinical diabetics (annexes 2 and 3). Depending on the budget and cultural pattern (West, 1971) an examination of urine is recommended for screening which has been collected two hours after the consumption of sugar or a meal that was rich in carbohydrates. Blood examination must be effected in blood that has been collected two hours after a loading dose of glucose or a meal rich in carbohydrates. Attention is drawn to the importance of the performance of a glucose tolerance test. "The oral glucose tolerance test seems to be more meaningful than the intravenous glucose tolerance test in estimating the efficiency of glucose disposal in patients with mild abnormalities of glucose tolerance" (Olefsky, 1973).

The Committee on Statistics of the American Diabetes Association (Klimt, 1968) has published directions for the standardization of the oral glucose tolerance test in 1968 (annex 4).
It has been recommended to classify the results of the examinations as "diabetic" and "non-diabetic" for each of the following criteria:

- the "Wilkerson Point Method";
- the "Fajans - Conn criteria";
- the "Summation of fasting, 1, 2 and 3 hours plasma glucose levels";
- other criteria.

Where possible the measured results should be mentioned.

In 1971 the "Medizinische Sektion der Schweizerischen Vereinigung für klinische Chemie" published "Neue schweizerische Richtlinien zur Diagnose des Diabetes Mellitus" (Teuscher, 1971). In that study it has been tried to provide advice focussed on actual practice. One of the detection methods is the determination of the bloodsugar percentage after a period of fasting. As separation values are mentioned:

50 - 100 mg%: normal (2.7 - 5.6 mmol/l).

100 - 130 mg%: borderline (5.6 - 7.2 mmol/l).

$>$ 130 mg%: pathological ($>$ 7.2 mmol/l).

The determination has to be repeated when a borderline or pathological bloodsugar percentage is found. When the results of two or more determinations exceed the 130 mg% limit the diagnosis diabetes mellitus is considered likely and further examination must follow.

A second detection method is the determination of the bloodglucose percentage two hours after a meal rich in carbohydrates. For capillary blood the following standards are indicated:

$\leq$ 130 mg% glucose: diabetes unlikely ($<$ 7.2 mmol/l).

130 - 180 mg% glucose: suspicion of diabetes (7.2 - 10.0 mmol/l).

$>$ 180 mg% glucose: diabetes ($>$ 10.0 mmol/l).

For venous blood the standards are 20 mg% (0.1 mmol/l) lower. With a result of 130-180 mg% a glucose tolerance test must be carried out for ultimate diagnosis. For values over 180 mg% a G.T.T. is contraindicated and in that case the determination must be repeated.
The oral G.T.T. with a loading dose of 50 g of glucose is recommended as a screening test which can be performed in a simple manner (annex 5). The criteria for the interpretation of the values are given in table 2.2.

Table 2.2
Interpretation of the 50 g G.T.T. in capillary blood.

capillary blood	fasting		60 min.		120 min.	
	mg% gluc.	mmol/l	mg% gluc.	mmol/l	mg% gluc.	mmol/l
normal	$<$ 100	$<$ 5.6	$<$ 160	$<$ 8.9	$<$ 120	$<$ 6.7
borderline	100 - 130	5.6 - 7.2	160 - 220	8.9 - 12.2	120 - 150	6.7 - 8.3
pathological	$>$ 130	$>$ 7.2	$>$ 220	$>$ 12.2	$>$150	$>$ 8.3

For the oral G.T.T. with 100 g glucose loading and venous blood sampling the study indicated that this should be carried out only on strict indication (e.g. with an ambiguous 50g test, or in order to test the maximum insulin secretion, etc.). As normal values for the G.T.T. with 100 g burdening are considered:

venous blood: fasting 100 mg% glucose (5.6 mmol/l)

1 hour 170 mg% glucose (9.4 mmol/l)

2 hours 120 mg% glucose (6.7 mmol/l)

3 hours 110 mg% glucose (6.1 mmol/l)

For interpretation of the data this study refers to the recommendations of the American Diabetes Association (Klimt, 1968). It is mentioned that it will be necessary to consume 250 g of carbohydrates in the three days preceding the G.T.T., as otherwise the chance of falsely positive findings will be great.

Another major complication in the early diagnostics of diabetes is the bad reproducibility of the G.T.T. (McDonald, 1965; Logie, 1974). "Technical" and "host" variables have their influences on the result. "Technical" variables are the quantity of glucose administered, the hour of the day on which the glucose is administered and the time elapsed since the last meal. "Host" variables include the nature of the foodstuff used for the test, the consumption of medicine and psysical activity (Klimt, 1968). This all renders the result of the test unique. It has also appeared that in the natural development of diabetes mellitus progression and regression are possible with an unpredictable speed (Fajans, 1974).
The significance of the decreased glucose tolerance in older people has not yet become quite clear (Andres, 1971). When the standard values for young people are also being used for older people, a high percentage of disturbed G.T.T.'s will be found in the higher age groups. Neither the WHO Expert Committee nor the American Diabetes Association Committee quantify the effect of ageing on the test of the glucose burdening examination.

Reubin Andres (1971) describes a nomogram with the variables age and 2-hour value of the G.T.T. "The percentile rank compares the subject's performance to that of his own age cohorts" (annex 6). As a warning he adds: "Until it is clear exactly what level of test performance truly carries with it increased risk, and until it is clear that prophylaxis is possible, and that therapy is helpful, it behooves us to adopt a conservative stand at the moment in our willingness to classify a middle-aged or older subject as diabetic on the basis of poor test performance alone".
This conservative attitude has been justified by results from other studies (Klimt, 1970; Logie, 1974; Jackson, 1974). The University Group Diabetic Program (Klimt, 1970) including in its goals "the evaluation of the efficacy of hypoglycemic treatments in the prevention of vascular complications in a long term, prospective clinical trial and study of the natural history of vascular disease in maturity onset, non insulin dependent diabetics" states that the data suggest that "tolbutamide and diet may be less effective than diet alone or than diet and insulin at least in sofar as cardiovascular mortality is concerned". In the group treated with tolbutamide or phenformin the mortality due to cardiovascular diseases was 14.7% and 12.7% respectively and 4.9% in the placebo group. Since no bias was found during statistical analysis the tolbutamide study was stopped in 1969. The phenformin study was terminated in 1971.

Feldman (1974) did not observe long term improvement of the glucose tolerance during the treatment of chemical diabetics with tolbutamide, but there was "suggestive — although not conclusive — evidence that phenformin may be of practical benefit to patients in this phase of the disease".
Logie et al. (1974) state the results in 72 patients with chemical diabetes which have been treated with a placebo. Only 4 patients developed overt diabetes.

Jackson (1974) found "a significant improvement in mean glucose tolerance in those so called asymptomatic diabetics who lost weight and no change in those who did not diet or lose weight" (one year follow-up).

A detailed analysis of the results of the University Group Diabetes Program (UGDP) and other controlled trials with hypoglycemic agents was published in 1975 by the Committee for the Assessment of Biometric Aspects of Controlled Trials of Hypoglycemic Agents (Gilbert, 1975). This committee states that "On the question of cardiovascular mortality due to tolbutamide and phenformin, we consider that the UGDP trial had raised suspicions that cannot be dismissed on the basis of other evidence presently available. We find most of the criticism levelled against the UGDP findings on this point unpersuasive".
"The possibility that deaths may have been allocated to cardiovascular causes preferentially in the groups receiving oral therapy exists and, in view of the "non-significance" of differences in total mortality, some reservation about the conclusion that the oral hypoglycemics are toxic must remain. Nonetheless, we consider the evidence of harmfulness moderately strong".

Chalmers (1975 concludes on the basis of this study: "The probability that oral hypoglycemic agents cause premature deaths from cardiovascular disease remains valid".

2.7 Overweight

There are no indications that overweight is an independent risk indicator for coronary heart disease (CHD). Indirectly, however, it does have its significance. Overweight tends to increase the blood pressure whereas it also is often combined with glucose intolerance (Keys, 1972).

The Minnesota Group (Keys, 1972) found that a multivariate analysis of the data showed that no measure of relative weight or obesity made a significant contribution to future coronary heart disease, when the factors of age, blood pressure, serum cholesterol and smoking were comparable. As an index for the relative weight the Quetelet index ($W/H2$) has been used. Analysis of length/ weight ratios has demonstrated that this was the least undesirable index (Khosla, 1967; De Wijn, 1968; Florey, 1970).

In the Framingham Study a statistically significant correlation has been demonstrated between coronary heart disease and 35% or more overweight (compared against the Metropolitan life insurance standard tables). "The CHD risk ratio is small; 1.6 in men and 1.4 in women" (Blackburn, 1974). The seven countries study showed "no significant relationship of relative body weight, body mass index and sum of skinfolds to non fatal infarct plus coronary heart disease death or death from all causes. Addition of body mass index to the logistic discriminant equation based on age, blood pressure, serum cholesterol and cigarette smoking of the multivariate analytical model, showed that the discrimination of coronary heart disease events was not significantly improved" (Blackburn, 1974). Blackburn concludes: "moderate overweight is not a strong contributor to future CHD risk in any population but weight reduction is desirable when indicated in an attempt to reduce the level of blood pressure, glucose intolerance, or serum lipids and to enhance a healthy self-image".

2.8 Physical inactivity

The significance of physical inactivity as a risk indicator for the contraction of coronary heart disease (CHD) is still far from clear. Froelicher (1972) puts after analysis of 35 epidemiologic examinations that "the results are both contradictory and inconclusive" (annex 7). Blackburn (1974) reaches the same conclusion: "Over 20 years of systematic researches have failed to provide a clear answer". This failure is partly due to inherent methodological factors, such as: "difficulty in accurately assaying physical activity; inability to assess the type of exercise that is most protective; lack of gradient of physical activity in general population and insufficient sample size to permit adjustment for confounding factors, or no available data regarding them" (Froelicher, 1972).

2.9 Personality structure, behaviour and stress

There is an anecdote in circulation about an upholsterer who had to do a repair job on the chairs of the Mount Zion Hospital in San Francisco. He drew the attention of the cardiologists Friedman and Rosenman to the peculiar wear of their waiting-room furniture. Of all the chairs in the hospital both back and seat were worn, in their department only the front edges of the seats (Appels, 1974).

These and analogous experiences induced the aforementioned cardiologists to pay special attention to the behaviour of their patients. This resulted in a classification system of behaviour types. It is claimed that the chance of coronary heart disease (CHD) differs with the behaviour types to be distinguished.

Unfortunately there is strong doubt concerning the reproducibility of the classification system and its usability in other cultural patterns (Blackburn, 1974). "That is not to say that individual or group behaviour is unrelated to pathogenesis or to the precipitation of coronary attacks in those susceptible in United States cultures. They probably are related; how much of the influence operates through neurohumoral influences on circulation, coagulation, inflammation, immunity, catecholamine activity, and lipid metabolism and how much these are related to "goal-less drives" and "chronic struggle", simple frustration, bad habits, overeating and depression etc.? No one is yet in a good position to answer". "Why die the rural fat-eating Finns, one of man's most civilized, calm, stolid outdoor working people at the highest rate of CHD known to man? Why is the CHD rate still very low in Japan where the frantic turmoil,

overcrowding, social competition and confusions of modern life are big problems?"
According to Blackburn (1974) these questions cannot be answered by making the factors stress and behaviour primarily responsible. Nor do the data collected by Jenkins (1971 a + b) clarify the significance of the psychic and social factors as precursors of coronary heart disease (Blackburn, 1974).

2.10 The electrocardiogram

The electrocardiogram (ECG) renders graphical information concerning the electrical activity in the heart. The classification of ECG patterns in "normal" and "abnormal" appears to entail problems in practice, partly caused by differences in observation, partly by differences in interpretation (Blackburn, 1965; Higgins, 1965; Elgrishi, 1970). Despite these, however, the ECG remains a valuable screening tool for coronary disease. The information is objective, simple, rapidly obtained and painless and largely independent of co-operation or language differences.
Blackburn et al. suggested a detailed classification of ECG's based on precisely defined criteria (Blackburn, 1960; 1969). This standardized coding system has become known as the Minnesota Code and it has been widely recommended for initial classification of ECG's for epidemiological purposes. "We have attempted to provide, in the words of the recommendation of the Research and Social Committees of the International Society of Cardiology," the reporting of findings in uniform, clearly defined, and objective terms with the least risk of confusion in regard to interpretation" (Blackburn, 1960). Rose says that the Minnesota Code represents a great advance in standardized reporting on electrocardiograms. Nevertheless, as before, it fails to provide an adequate basis for comparing the results of different workers. This situation can be improved by (a) standardized training with supplementary rules on exact techniques of measurement and (b) testing performance routinely". He shows that medically unqualified technicans can be readily taught such a system (Rose, 1965).

Higgins et al. (1965) deal more extensively with the reproducibility of the code. In order to obtain an impression of the interindividual observation differences, he describes the classification according to the Minnesota codification of 31 ECG's with deviations. In 14 cases there is a marked difference between the classifications. Also the intra-individual observation differences are important. Of 440 ECG's read on two occasions, 239 were classified as showing no recordable items each time. Similary 169 were classified as having one or more reportable items on both occasions, 22 were called normal on the first occasion but abnormal on the second. Ten were called abnormal on the first and normal on the second. Exact measuring of the ECG's (width and depth of Q, magnitude of R, S and T in all leads, height of P and P-R interval in lead II) considerably improves the results (Higgins, 1965).

"However, an important degree of human observer variation persists even in such an "objective" attempt to characterize the "abnormal ECG", and even among trained coders" (Blackburn, 1965).

The "Groupe d'Etude sur l'Epidémiologie de l'Athérosclérose" (GREA) has used a particular protocol for the Minnesota Code since 1966 and examined the reproducibility of the code (Elgrishi, 1969, 1970). The GREA concludes that "although the reproducibility of the interpretation is still imperfect and much effort is still required, the Minnesota Code, with its procedural application, remains at the present time the only means of achieving a standardization of the manual coding of electrocardiograms in the course of epidemiological investigation.
Much of the element of reproducibility is improved by computer programming for ECG coding but there is still a large commitment of many population studies with conventional paper tracings" (Elgrishi, 1970). Then also there is the statement by Blackburn in 1969: "Computer programs dealing with detailed ECG amplitudes and other characteristics may provide different classifications, and provide them more efficiently".

Deviations, found on the resting-ECG supply a contribution towards the identification of people with an increased chance to contract CHD. Rose (1971) finds in 1127 people (35-59 year old) in the first seven years of a follow-up study "79 men who developed major coronary illnesses (37 deaths, 34 cases of non fatal myocardial infarction, and 8 cases of major angina only). In 23 of these men the first major illness had been preceded by a positive ECG". According to the Coronary Drug Project Research Group (1972) "Ambulant post infarct patients with a normal ECG had one third the mortality risk of those with residual ECG findings and an ST-segment depression of the ischemic type was the most important independent risk predictor of all clinical and ECG findings studied". "Also patients with frequent ventricular premature beats on a single ECG at time of entry of the study had over twice the mortality of those with rare or no ectopic activity. This difference was significant even after correction for other coronary heart disease (CHD) risk indicators was made" (Lown, 1971).

"If the resting-ECG is normal, evidence suggestive of coronary disease may be obtained in a proportion of cases by reporting it under some form of stress, usually exercise. The combined results of 16 studies show that 68% of the patients with coronary artery narrowing of over 50% reveal ST-segment depression of 1 mm or more by a graded exercise test on a bicycle ergometer or treadmill. When the coronary angiogram was normal, only 9% showed an abnormal ECG during graded exercise tests" (Simoons, 1973). When a horizontal ST depression of 0.05 mV (0.5 mm) is interpreted as an abnormal finding the sensitivity for detection of coronary heart disease (CHD) increases to 83% but the specificity declines to 67%. Thus the number of false positive findings becomes too high to be acceptable. On the other hand ST depressions of 0.2 mV (2 mm) or more are very seldom found in patients without obstructive coronary artery disease. The specificity for this degree of ST depression is 98%. These results were obtained by visual interpretation of the ECG during exercise in 347 patients in different series. However, the interpretation of exercise ECG's is often difficult when baseline drift and noise from skeletal muscles is present. Therefore it has been attempted to improve the diagnostic value of the exercise-ECG by computer processing. Ascoop (1974) studied 87 patients who underwent selective coronary arteriography. Most patients were selected

because they had a normal exercise-ECG previously. Visual analysis yielded a sensitivity of only 17%, while the specificity was 100%. Measurement of the amplitude and slope of the ST-segment by computer in lead C.C.5 increased the sensitivity to 72% and reduced the specificity to 90%. Similar results were obtained by Simoons (1975) who studied the exercise-ECG in 139 normal subjects and 95 patients with CHD and a normal ECG at rest. Best results in his study were obtained when the ST measurements were compared with the normal range of the measurements at the same heartrate. A likelihood ratio was employed to express the probability that a given individual has significant obstructive coronary artery disease. Computer processing in this study also permitted the design of criteria for interpretation of the exercise-ECG in patients with an abnormal ECG at rest.

Doyle et al. (1970) describe "the prognosis of an abnormal electrocardiographic stress test of 2003 men who had at least two ECG stress tests, 264 developed some manifestation of ischemic heart disease (IHD) and 75 of them had an abnormal electrocardiographic response to exercise as their first manifestation of IHD. Over the next 5 years there was a 85% probability that these 75 men would develop another manifestation of IHD, namely angina pectoris, myocardial infarction or sudden death. Only transient ischemic flattening or coving of the ST-segment induced by exercise, proved to be a diagnostically useful index of potentially inadequate coronary arterial perfusion. Ischemic T-wave changes and paroxysmal left bundlebranch block were not useful criteria".

"The angiographic severety of coronary artery disease correlates strongly with the frequency of positive tests (40%, 66% and 76%, with 70% or greater occlusion of one, two or three vessels respectively)" (Bartel, 1974). This study has also shown "that the angiographic occurrence of collateral vessels was related to the extent of coronary disease and was associated with a higher percentage of positive exercise tests; no protective effect of collateral circulation could be demonstrated".

"The incidence of both ventricular and supraventricular complexes increased with age" (McHenry, 1972). In this study "the incidence of ventricular premature complexes for any given age group was also greater in patients with definite or suspected cardiovascular disease. However, the appearence of unifocal ventricular premature complexes during maximal or near maximal exercise testing should not be equated with the presence of clinically significant cardiac disease".

Jelinek (1974) did not succeed in giving a clear answer to the question whether the occurrence of ventricular premature activity with exercise stress is a specific marker for CHD".

Fisch et al. (1973) analysed the ECG's of 40 patients with "rate dependent aberrancy (RDA). The types of aberrancy were left bundlebranch block (LBBB) in 32 patients, right bundlebranch block (RBBB) in four, left anterior hemiblock (LAH) in three and in one patient incomplete RBBB was present. In the conclusion he puts "obvious heart disease was present in all but one of our patients with RDA. On the other hand, in some instances of established LBBB evidence of significant heart disease may be absent. It is possible that in such patients the bundlebranch block is due to a localized area of fibrosis interrupting the bundlebranch, with the rest of the myocardium and the

coronary vessels normal. However, if rate dependent BBB is a function of altered local perfusion, significant clinical heart disease is most likely to be present".

2.11 Combined risk indicators

It has appeared from prospective studies that the "morbidity and mortality rates from coronary heart disease (CHD) among Americans differ markedly, particularly when classified with respect to serum cholesterol, blood pressure and cigarette smoking, considered simultaneously" (Stamler, 1970). "Those free of the three risk indicators experienced much lower CHD morbidity and mortality rates over a ten year period than did the group of men with any two or all three of these traits". There was found that the "CHD mortality rate was one-third to one-sixth as high and the sudden death rate was one-fourth to one-sixth as high".

Keys et al. (1972) "using multivariate analysis, related the characteristics of 11,132 men aged 40-59 years and free from CHD at entry to follow-up experience (5 years follow-up). The characteristics used were Body Mass Index (BMI = weight in kilograms divided by the square of height in meters, systolic blood pressure in supine position, serum cholesterol, smoking habits and age). These characteristics were related to two categories of CHD: hard CHD and any CHD. Hard CHD means death from CHD or definite myocardial infarction, any CHD included four categories: classical angina pectoris, clinical heart disease; clinical diagnosis of possible heart disease and a history of myocardial infarction; defined Minnesota ECG codes". It appears to be possible, with the aid of a formula "to estimate the probability of the development of CHD in an individual. There is no indication that BMI makes a significant contribution to the risk or its evaluation. Consideration of only four variables (age, systolic blood pressure, serum cholesterol and smoking habit) suffices to identify men whose likelihood of dying from CHD or having definite infarction within 5 years is greatly above the average. By the same token, it is possible from these characteristics to identify men who are most unlikely to become CHD victims in 5 years."

2.12 Aspects of ageing

"Despite the great strides of modern medicine the estimated life expectancy of men who reach and surpass the age of 40 is actually unimproved in 1970 compared to that in 1900" (Lew, 1970; table 2.3).

Table 2.3
Observed and Projected Expectation of Life for White U.S. Men.

Age (years)	1900	1930	1960	1970
0	52.8	63.4	67.4	67.7
5	59.9	63.8	64.4	64.4
10	56.0	59.3	59.6	59.6
20	47.9	49.9	50.1	50.1
30	39.6	40.9	40.9	40.9
40	31.2	31.7	31.7	31.7
50	23.1	23.2	23.2	23.2
60	15.7	15.9	15.9	15.9
70	10.2	10.2	10.2	10.2
80	5.9	5.9	5.9	5.9

"Whatever social affluence and medicine have achieved, something else has taken away; that something else is principally the atherosclerotic, coronary and cardiovascular disease epidemic" (Blackburn, 1974).

Hypertension

With Americans the prevalence of hypertension increases when getting older (Lew, 1973; annex 8). The mortality as a consequence of hypertension decreases with age. "For instance, in men under 40 with casual pressures of 150/100 mm Hg, mortality was approximately 325 per cent that of standard insured risks, whereas men aged 40 and over showed a mortality of about 225 per cent (annex 9). With 45-54 years old male Caucasians 17.3 per cent have a systolic blood pressure of 160 mm Hg or over or diastolic 95 mm Hg or higher, for 55-64 years old this percentage amounted to 28.4.

Smoking

According to American and Dutch data the prevalence of smoking cigarettes decreases with men of 45 year and over, but judging by social medical standards the situation is still very unfavourable (De Haas, 1973; Lew, 1973). "The relationship of cigarette smoking to CHD risk in American studies is strongest at younger ages, and its "effect" is independent of, and at least

additive to, that of serum cholesterol, blood pressure and activity habits. Though relative CHD risk related to smoking declines with age, absolute CHD risk increases" (Blackburn, 1974).

Serum cholesterol

From examinations of Americans (Johnson, 1965; Lew, 1973) and Dutchmen (De Wijn, 1972; Geerdink, 1973) it appears that the cholesterol percentage in the serum is on the average higher with older people than with young people (annex 10). "Although there is no evidence of a critical level of serum cholesterol which separates high from low risk individuals, elevated serum cholesterol as a risk indicator in coronary heart disease is strong at the younger ages only" (Stamler, 1970; Lew, 1973).

Diabetes mellitus

"If standards of normality for all ages are constructed from data derived from studies on young adults, then fully half of the older population will fail the test and thus be judged diabetic (Andres, 1971). This distressingly high apparent prevalence of diabetes in older individuals has led to the evolution of two schools of opinion: one considers the progressive decline in glucose tolerance with age to be due to the gradual evolution of increasing numbers of true diabetics, i.e. a pathological change. The other view maintains that these changes are non-pathological manifestations of the ageing process in the general population. This leads to different approaches to the technique of interpretation of test results". At this moment there are still no data available on the basis of which an opinion can be given about the fact whether or not the test results must be corrected for the age.

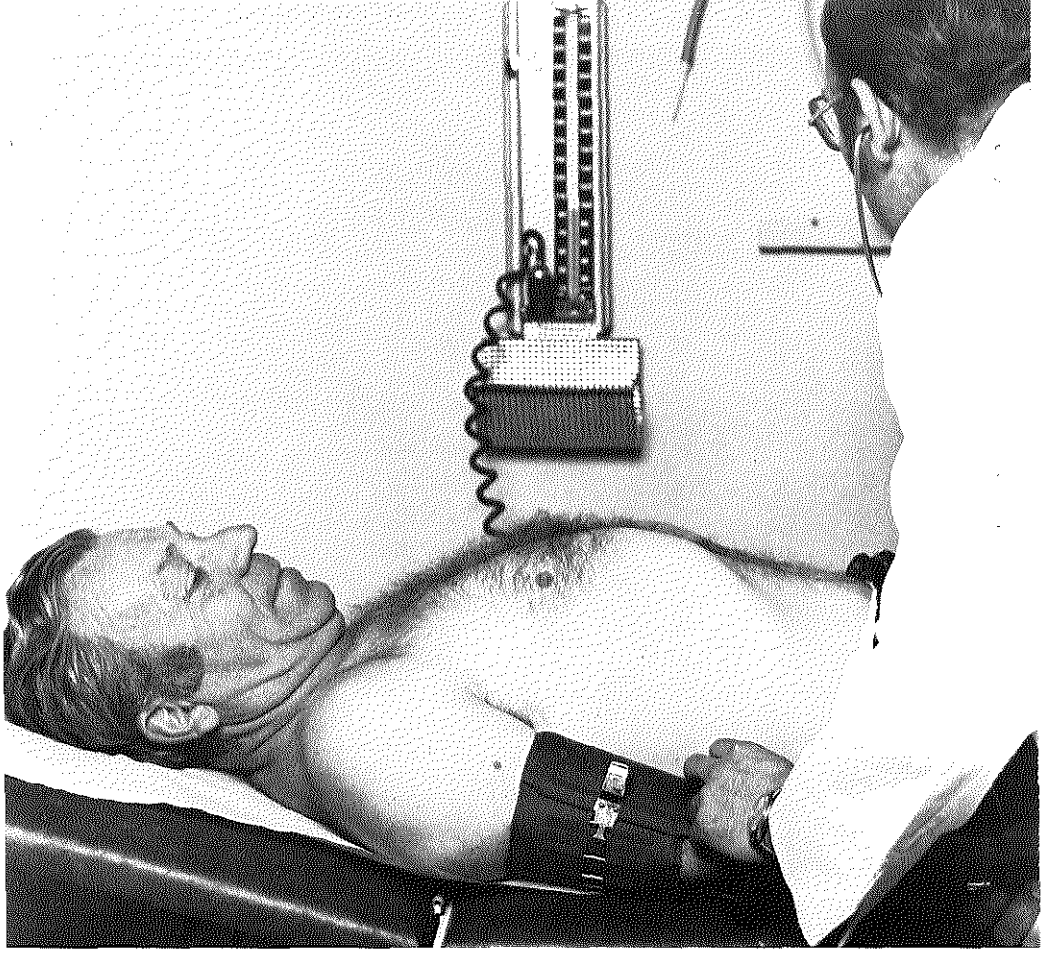
There are doubts about the usefulness of the treatment of adult-onset diabetes mellitus with medicine (Klimt, 1970). "Hygienic emphasis on weight reduction, physical activity, blood pressure lowering, with reduction of serum lipids and smoking habits, might well be a more rational, effective and safer approach than the traditional pharmacological one" (Blackburn, 1974; Chalmers, 1975; Gilbert, 1975).

Electrocardiogram

Simonson (1972) describes "the effect of age on the electrocardiogram". "There are significant electrocardiographic age trends in adult healthy populations from the third to the fifth decade in QRS and T amplitudes. The amplitudes decrease. Overweight accelerates the age trends. Poor progression of the R wave in the anterior chest leads, often interpreted as compatible with anterior wall myocardial infarction, is a normal age trend. The frequency of ischemic response to exercise increases clearly with 40 year old people and older".

Chapter III

The repeat screening



3.1 Introduction

In 1971 the Occupational Health Service for the Port of Rotterdam has started a standardized screening effort within the scope of optimal health care for older dockworkers. The program of the Committee for Detection and Prevention of Ischemic Heart diseases (COPIH, Commissie Opsporing en Preventie van Ischaemische Hartziekten) of the Dutch Association for Labour and Industrial Medicine (NVAB, Nederlandse Vereniging voor Arbeids- en Bedrijfsgeneeskunde). has provided the bais for this screening.
It has been supplemented with a roentgenogram of the chest (Odelca) and a dynamic stress test on the bicycle ergometer. During this first investigation (which will hereafter be called screening I) data have been collected from 503 persons that were 55 years old or over on January 1, 1971.
Between October 1972 and November 1973 the 503 participants of screening I have been invited for a repeat screening. The attendance of this screening (called screening II hereafter) was as follows:

Total number of persons invited		503 (100 %)
Total number of persons non appearing		56 (10.9%)
1. deceased between screening I and II	9 (1.8%)	
2. prolonged illness	17 (3.4%)	
3. moved/inaccessible	7 (1.4%)	
4. refusers	22 (4.4%)	
5. below age limit	1 (0.2%)	
	56 (10.9%)	
Number of people that appeared for screening II		447 (89.1%)

All those who refused the initial invitation for rescreening, have been personally visited by the author where possible. This resulted in the fact that 25 initial refusers did consent to participate in screening II and this reduced the total number of participants not involved in the follow-up study further to 56. Through these visits an impression of the motivation for refusal has been obtained. Details of the reasons why a number of people did not appear have been specified in annex 11. The motive for the initial refusal by the group of 25 that ultimately did participate in the examination has also been given.

3.2 Procedure

The examination has been carried out at the Occupational Health Service for the Port of Rotterdam by a team, consisting of 7 members. These were:

Piet Ophof	industrial physician;
Adri Schelling	physician;
Willem Westerveld	occupational health male nurse;
Coby Buys	laboratory technician;
Ank Möhlmann	laboratory technician;
Lieke Hillen - van Noort	secretary; *
Sjanie den Boef-de Jong	secretary. *

After consultation with personnel supervisors at their place of work the dock-workers were invited by letter to participate in screening II. The screening was done during regular working hours, and was free of charge. Those workers who had retired also could participate, while their travelling expenses were reimbursed. All these steps were taken to achieve maximal attendance.

In general 4, but at times 5 people were examined each day. The participants were received by the secretary, who provided guidance in the completion of the questionnaire. Next the X-ray examination of the thorax was carried out. The male nurse prepared the patient for the remainder of the examination. The exercise test was done under supervision of one of the physicians. The physicians performed the physical examinations every other day. All essential decisions were made after mutual consultations. All blood samples were obtained in a fasting state. Instructions for the fasting test were sent by letter to the participants (annex 12). Approximately one week later the participants were invited to revisit the physician that had performed the examination in order to discuss the results of the examination. In certain cases advice was given during this interview to change occupation or to contact the general practitioner for further treatment. All examination results were sent by letter to the respective general practitioners.

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* *Lieke Hillen-van Noort has assisted in the repeat screening until December, 1973 after which date Sjanie den Boef-de Jong took over the care for the secretariat.*

3.3 Characteristics of the population

The age criterium employed was that the participant had to be fifty-five years old or over on January 1, 1971. The occupational criteria for inclusion were dockworker, stevedore I, stevedore-deck, deckhand, cold store operator, forwarding hand, trimmer and rivercraft skipper.

At screening II it appeared that 120 participants (26.8%) were no longer active in any of these positions. In 70 of them this was because of health conditions and in 50 because of retirement upon reaching the age of 65.

3.4 Method of examination

3.4.1. History

Anamnestic information has been collected by means of a standardized questionnaire. The secretary, who had been especially trained for this purpose, interviewed the participants and entered the replies to the questions on the questionnaire herself (annex 13).

3.4.2. Examination

The biometric determinations (height, weight and resting-electrocardiogram) have been performed according to the insructions provided by the Committee for Detection and Prevention of Ischemic Heart diseases (COPIH handboek versions '72-'73). All were done by the male nurse. The measurement of the blood pressure was carried out by the male nurse and by the physician. A cursory physical examination was carried out by the physician which included auscultation of heart and lungs with palpation of peripheral arteries and inspection for varicose veins.

The electrocardiogram

For the electrocardiogram a three-channel automatic cardiograph (Hewlett & Packard, 1514A ECG-Phonosystem) was utilized. Standard electrodes were used on the limb leads, for the chest leads suction electrodes were employed.

The ECG was taken while the examinee was reclining comfortably on a wide examination bench. The standard 12 leads (I, II, III, aVR, aVL, aVF, V_1 - V_6) were obtained at 50 mm paper speed.

The arterial blood pressure measurement

The measurement of the arterial systolic and diastolic blood pressure was carried out after the resting-ECG had been recorded. The participants were left at least 7 minutes in the same recumbent position before the blood pressure was measured. The first measurement was carried out by the male nurse, who had been especially trained for this purpose during screening I. The second measurement was done by the physician. When the results of both diastolic blood pressure measurements differed by more than 5 mm Hg the physician carried out a third measurement. Of the two measurements closest together the lowest was taken as the representative value. The Erkameter cuff manometer utilized had a width of the inflation cuff of 12.0 cm. The supporting band was 14.5 cm. Calibration was performed before and after the examination.

Ventilation

By means of a Book spirograph (Medisch Technische Industrie Haarlem) and the Wright Peak Flow meter, the following ventilatory lung functions were determined.

- Forced Expiratory Volume 1 sec.;
- Forced Expiratory Volume 5 sec.;
- Vital Capacity;
- The quotient FEV_1 / $FEV_{5\ sec.}$;
- Peak Expiratory Flow rate.

Chest roentgenogram

A chest roentgenogram was obtained with a camera with automatic developing system*. The interpretation of these miniature photographs (10 x 10 cm) was done by two qualified industrial physicians. They employed a double reading system. The same physicians involved in screening I carried out the interpretations in screening II.

In addition to a general description of the photograph, a number of abnormalities were coded according to table 3.1:

* *Odelcacamera 100 — XVII — S 2S01 f = 213 mm GRA 1: 0.65 10 x 10 cm. Development aid Odelcamatic type ODM 4, Nr. L02445 KW 3.*

Table 3.1

Coding list of the chest roentgenogram.

no abnormalities	0
emphysema	1
other lung abnormalities	2
elongated aorta or prominent aortic knob	3
hypertrophy of the heart or enlarged heart	4
code 3 + code 4	5
code 3 + codes 1 or 2	6
code 4 + codes 1 or 2	7
code 1 or code 2 + code 3 + code 4	8

3.4.3. Biochemical determinations

Urine examination

The urine, collected in the evening prior to the examination, was analysed by means of the Haemacombistix (Ames) for the presence or non presence of albumen, glucose and blood.

Blood examination

Samples of venous blood, obtained under fasting conditions, were analysed for:

- haemoglobin percentage (cyanide haemoglobin HiCn method);
- blood sedimentation rate (BSR);
- blood sugar percentage (orthotoluidine method);
- serum cholesterol percentage (Liebermann-Burchard);
- total lipid percentage (phosphovanilline method).

In contrast to screening I, during which the serum cholesterol, the total lipid and the blood sugar percentages were determined in the Gaubius Institute at Leyden, this time only the determination of the total lipid percentage was performed there.
Since recent evidence has shown that the determination of cholesterol in blood-plasma showed large and inconstant differences, only serum determinations were made (Boerma, 1974). The total lipid percentage was also made on serum.

Comparison of the blood tests done in the Gaubius Institute and our own laboratory

In 50 blood samples the serum cholesterol and the blood sugar percentage have been determined according to the "COPIH" instructions, both at the Gaubius Institute and in our own laboratory. A comparison was carried out to determine the extent of interlaboratory differences operative at time of screening II.

The result of the cholesterol determinations

The average difference between the result of the Gaubius Institute and the result of the Rotterdam laboratory for serum cholesterol was — 0.03 g/l and significant at the level of 5% (table 3.2). A systematic measuring error may be the cause. However, considering the amount of the difference, the practical significance is quite small.

Table 3.2

The results of the serum cholesterol and the blood sugare determinations.

		Serum cholesterol	blood sugar
Number of determinations	(n)	50	50
Mean difference (results of our laboratory minus results of the Gaubius Institute)	$(\overline{V})$	—0.03 g/l	0.10 mmol/l
Standard deviation	(s.d.)	0.09	0.23
The paired t-test	$(t_{(49)})$	—2.33	2.95
Tail-probability	P	<0.05	< 0.01

The result of the blood sugar determinations

For blood sugar the average difference between our own laboratory and Lyden was also significant, $P < 0.01$ (table 3.1). The Rotterdam values were on an average 0.10 mmol/l higher than those of the Gaubius Institute. Again the practical significance is quite small.
The significant differences in the methodology of the two laboratories do have consequences when differences between screening I and II are found, but since observed differences were small and of little clinical importance, they have been ignored in this study. It is furthermore possible that the measuring error has changed with time. For this reason the cholesterol values were checked weekly against a standard serum, Dade Monitrol II, during screening II. The reliability limit was 125-153 mg% (3.2-4.0 mmol/l) for 46 determinations. The reliability limits were not exceeded in a single instance. The same was done with blood sugar. Checking serum again was Dade Monitrol II. The reliability limits were 211-243 mg% (11.7-13.5 mmol/l) for 44 determinations. The lowest reliability limit was exceeded only once with a volume of 11.6 mmol/l.

The oral glucose tolerance test

An appointment for an oral glucose tolerance test (G.T.T.) was made when the blood sugar percentage of the fasting blood sample exceeded 5.6 mmol/l or when a positive reduction was found in the urine. When an abnormal glucose tolerance test or the existence of diabetes mellitus was known prior to screening II it was not repeated.

Appointments were made to return to the laboratory in a fasting state. First a blood sugar was determined in capillary blood. Then the glucose tolerance test was performed after drinking 106 grams of glucose dissolved in water (1 bottle of Hycal). Capillary blood samples were obtained half an hour, one hour and two hours after ingestion of the glucose solution.

3.4.4. The determination of the exercise tolerance

The available equipment existed of:

— a bicycle ergometer with an Eddy current brake (Lode-bicycle patent number 65391).

  This type of brake is based on electrical resistance. The resistance of the brake is calibrated in Watts and was continuously adjustable. The product of a selected level of Watts and a variable number of rotations per minute (between 40 and 85) is automatically held constant in order to provide a constant work load. Calibrations were performed before and after the examination. No differences were found between these.

— a three-channel automatic cardiograph (Hewlett & Packard, 1514A ECG-Phonosystem).

  The ECG recorder measures the bio-electric potentials of the heart and automatically records these voltages on a thermal chart recorder within the apparatus. The instrument is capable of recording the conventional 12-lead electrocardiogram.

— oscilloscope (Hewlett & Packard Sanborn 780-6A Visoscope).

  In this oscilloscope the cathode-ray tube has a 10 x 10 cm parallax-free internal display marked in cm squares. Major horizontal and vertical axes have 2 mm subdivisions. On the oscilloscope the ECG was continuously monitored.

— a cardio-tachometer (Rood, type 106).

  This cardio-tachometer provides a continuous beat by beat calculation of the heart rate (range 30-150, 60-300 and 120-600 beats per minute). An ECG-output permits the recording of the cardio-tachogram simultaneously with the ECG.

— a direct writer (Goerz type RE 511).

With the aid of this writer the heart rate was simultaneously recorded as a curve of frequency (on the Y-axis) versus time (on the X-axis).

— a frequency printer (MFI - Sodeco printer).

The printer provides the mean cardiac frequency at each successive minute during the exercise test.

— a pneumography accessory (Hewlett & Packard 108).

The pneumography accessory provides a signal of the respiratory movements both for monitoring on the oscilloscope and for recording on the third channel of the ECG recorder.

— Erka blood pressure meter.

Since manual inflation of the cuff of the blood pressure meter is too time consuming compressed dry nitrogen was used to inflate the cuff during the exercise test.

The exercise test was carried out only when at the pre-examination no contra-indications were present. In 17 out of the 447 participants (3.8%) this proved the case. Individual causes are stated in annex 14. The exercise test took a maximum of 35 minutes. At the onset the participants were allowed to relax for three minutes while sitting on the bicycle. During this period reference data were recorded. Then according to a stepwise schedule with an initial load of 3 minutes of 15 Watt, followed by 3 minutes of 45 and again of 75 Watt, exercise was carried out. The following 3 steps at loads of 105 Watt, 135 Watt and 165 Watt had to be maintained for 5 minutes each. When this proved necessary the examination was stopped before maximum load was achieved (see for indications annex 15). Immediately after the test was terminated the participants were observed for another 8 minutes while sitting on the bicycle in resting conditions.

During the exercise and recovery phases the following observations were made:

— **the clinical appearance** of the participant such as his complexion, his locomotion pattern and the degree of perspiration.

— **ECG leads** CM_4 and CM_6. These leads were continuously visible on a oscilloscope. The two electrocardiographic leads were recorded for 10 seconds during every third minute and at the last minute of the various levels of stress. During the recovery phase registration took place for 10 seconds during every minute including the eighth minute.

— **cardiac frequency**: This was continuously observed on the cardiotachogram. The number of beats per minute was printed every minute on a strip of paper with the aid of the frequency printer.

— **respiratory frequency**: This was written simultaneously with the ECG and calculated later from the record.

— **arterial blood pressure:** the measurement of the systolic and diastolic blood pressures took place in the final 15 seconds of each minute. At the start of the first minute of the recovery phase the systolic blood pressure was also measured for 30 seconds, in order to trap rapidly changing peak pressure levels.

3.4.5. Interpretation of the data

The author and his co-workers interpreted the collected data jointly to the farthest possible extent. Also my colleague Baart, the project director of screening I, was frequently consulted. The aim was to limit interindividual observation differences as much as possible.
The following procedure was adopted:

— resting-ECG;

The record was interpreted before physician and male nurse started with the exercise test. When abnormal, the exercise test was not executed. All resting-ECG's were subsequently reread under supervision of Prof. Dr. A.C. Arntzenius*.

After the examination the resting-ECG's of screening I and II were coded again in a few weeks time by one observer.

— exercise-ECG;

The interpretation and classification of the exercise-ECG's have been done in consultation with Baart. The criteria used are specified in annex 16. When differences of opinion arose the advice of Prof. Dr. A.C. Arntzenius was asked. Moreover the author and Simoons** restudied the exercise-ECG's of screening I and II in order to select records showing an ST-segment depression of 1 mm or more during the exercise and/or recovery phases relative to controle value.

3.4.6. The result of the individual examination and the advice regarding capacity for work

In principle, the result of any examination can be divided into an occupational health aspect and a curative aspect. The occupational health aspect concerns mainly the balance between working capacity and stress level. Since the dynamic exercise test supplies quantitative information regarding the maximum level of tolerable physical stress suitable measures can be taken when disturbances of this balance exist.

In terms of workcapacity the following options are open:

1. the participant will be declared completely able to work in his function;

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* *Professor of cardiology at Leyden University.*

** *Head of the Exercise Laboratory, Thoraxcenter, Erasmus University Rotterdam (Head Prof.P.G. Hugenholtz).*

2. the participant is partly able to fulfill his function. This means that the physically most exerting tasks in his job must be decreased or eliminated.

3. the participant is declared completely unable to carry out his function. In this instance there are two alternatives possible:

— either the participant is **completely** unable to perform **any** activity;

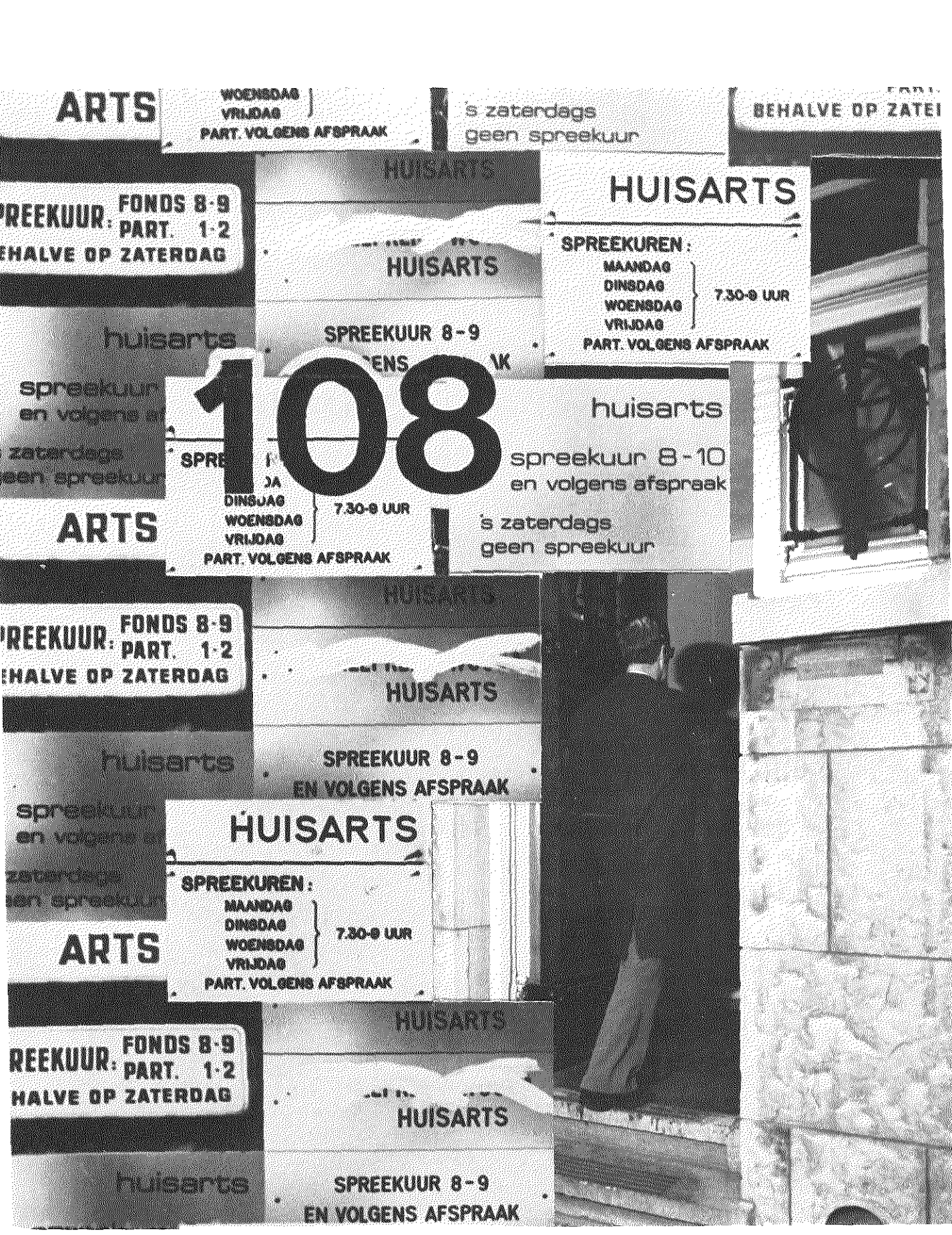
— or the participant is completely unable to carry out his **function**, but is able to perform another (physically less demanding) function.

The examination results concerning the work capacity were discussed with the participant and when he agreed with his personnel manager. The personnel manager took care of job adaption in co-operation with the doctor. To change job or to stop work had only minor financial complications for the man.

The examination results concerning the work capacity were discussed with the participant and when he agreed with his personnel manager. The personnel general practitioner since Dutch law forbids an industrial physician to take curative measures himself. An exception to this situation is the provision of first aid in case of accidents (Nederlandse Staatswetten, 1974). During the study no need for such first aid existed. All examination data have been sent by letter to the general practitioners concerned (annex 17).

Chapter IV

Visits to the general practitioners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geen spreekuur
BEHALVE OP ZATE
HUISARTS
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PART. 1-2
EHALVE OP ZATERDAG
HUISARTS
SPREEKUUR 8-9
EN VOLGENS AFSPRAAK
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DINSDAG
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VRIJDAG
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PART. VOLGENS AFSPRAAK
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REEKUUR: FONDS 8-9
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HALVE OP ZATERDAG
HUISARTS
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EN VOLGENS AFSPRAAK

4.1 Introduction

After examination I, Baart (1973) gave a number of the participants the advice to contact their general practitioners in order to discuss the abnormalities which were found. In order to obtain an impression of the extent and nature of the corrective and curative measures taken, a large number of general practitioners to whom patients had been referred were contacted. After an introductory letter requesting co-operation, the author visited all these general practitioners at their homes or offices (annex 18 and 19). By means of a standardized questionnaire information was obtained regarding the medical policy that had been followed for these patients after the initial advice. He also asked the opinion of the general practitioners about a number of general aspects such as their opinion on screening examinations and the relationship between industrial medicine and their practices (annex 20).

4.2 Organization

After screening I, 129 participants have been advised to contact their general practitioners on the basis of the following findings:

- the serum cholesterol percentage was equal to or exceeded 3.0 g/l;
- the 2 hour value of the glucose tolerance test was 5.6 mmol/l or over;
- the diastolic blood pressure (phase IV) during exercise rose to 100 mm Hg or over or the diastolic blood pressure during rest in recumbent position was 100 mm Hg or higher.

These 129 participants were distributed over the practices of 108 physicians. The regional distribution of these general practitioners showed that 67 of them practised within the city limits of Rotterdam and 41 outside Rotterdam (annex 18).

A questionnaire was drawn up by the author, in consultation with Prof. P.G. Hugenholtz, Prof. Dr. J.H. de Haas and colleagues of the Occupational Health Service for the port of Rotterdam and included the advice of several retired general practitioners. Next a pilot study was carried out in 12 Rotterdam practices, not included in the group of 108 general practitioners.

The questionnaire consisted of two parts (annex 20). Part I includes questions that aim at getting an impression of the treatment of the risk indicator(s) found in the participants. Part II contained the questions regarding the general opinion of the physician about screening procedures, of industrial medicine in particular and also of the communication between the screening team, the person examined and the general practitioner. The author entered the answers to the questions directly on the forms. At the Occupational Health Service the secretary checked whether the questionnaire was complete. The data were then filled in on a mark sensing form (annex 21). Before the mark sensing forms were handed in for processing another check for completeness was carried out by the male nurse.

Chapter V

Statistical methodology

5.1 General

All data collected from the COPIH questionnaire and by the examination including the exercise tests were transferred to punchcards at the "Institute TNO" for Mathematics, Data Processing and Statistics. The statistical evaluation of all data (the follow-up study and the information collected from the general practitioners) has been carried out at the Institute of Biostatistics of the Erasmus University at Rotterdam.*

5.2 Statistical data processing

5.2.1. Checking for the accuracy of the raw data

The punched data were checked for accuracy as follows:

a) **extreme values**

All excessively high and low values on punchcards, as compared to stated borderline values, were checked against the data given in the records of the participants. Where errors were detected the data on the punchcards were altered accordingly. Data on borderline values have been given in annex 22.

b) **consistency**

The response to mutually related questions entered on the punchcards have been checked for consistency. If not, the cause was traced and the punchcards were properly corrected.

5.2.2. Descriptive statistics

The information collected has been summarized with the aid of a number of statistics (Siegel, 1956; De Jonge, 1963, 1964):

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*) *Head* : *R. van Strik*
Projectsupervision: Drs. H.J.A. Schouten

— the sample mean: $\bar{x} = \frac{1}{n} \Sigma x_i$

— the sample standard deviation: s.d. $= \sqrt{\frac{1}{n-1} \Sigma (x_i - \bar{x})^2}$

— the percentage elements in the sample with characteristic E:

$$\text{percentage} = 100 \times \frac{\text{number of elements with characteristic E}}{n}$$

In the formulas n symbolizes the total number of values x_i in the sample.

Since the individual measurements fluctuate around their mean the standard deviation indicates the order of magnitude of the difference between an individual value and the mean value. In some cases this difference will be smaller, in other cases larger than the standard deviation.

5.2.3. Statistical tests

Statistical significance of either observed differences as to means or proportions, or observed correlations, has been tested according to conventional methods described below. These tests have always been performed in a so-called two-step manner (Siegel, 1956; De Jonge, 1963, 1964).

1. **Rank tests**

The two-sample test of Wilcoxon, sometimes also called the Mann-Whitney U-test, and Spearman's test for rank-correlation were employed.

a) Wilcoxon's test

This test indicates the degree of confidence of the assertion that two population means do or do not differ from each other.
When the tail-probability P is calculated, it is assumed that the two samples follow the same distribution i.e. stem from the same population. This is called the null-hypothesis. The credibility of this null-hypothesis is judged from the value of P, the probability under the null-hypothesis of the observed, or a larger, difference. P is obtained via the, approximately, unit normal deviate z. When P exceeds 0.05, it is normal practice to consider chance as the cause of the observed difference and no difference between the two populations has been demonstrated. When P is below 0.05 the difference is considered statistically significant and it is not likely that the difference is caused by chance. It must be kept in mind that significant differences are not necessarily important differences. It must also be evident that about 5 out of every 100 statistical tests may turn out to be significant when both samples have actually been taken from the same population. This must be taken into account when a large number of tests is performed and relatively few of these tests supply a significant result. This was found to be the case in the present study.

b) Spearman's test

Whether two variables are significantly correlated or not has been studied with Spearman's rank correlation test.

2. **Test for proportions**

When a variable can assume only two values it is called a dichotomy. This is particularly so when possible answers are yes and no only (''no opinion'' left out of consideration).

a. one sample

Whether in a sample one question was significantly more frequently responded to than another question has been judged with the McNemar test.

b. two samples

Whether the tested populations gave in one sample a certain answer significantly more often than in another sample was checked with Fisher's exact test.

5.3 Presentation of the results

The results of screening I and II have been expressed in an uniform way by crosstabulation. This makes it possible to recognize changes of a certain characteristic with time. The tables have been composed according to the following principles which are illustrated here by the example found for serum cholesterol (table 5.1).

Table 5.1: Crosstabulation of the serum cholesterol percentage (%)

screening I			screening II						
g/l	results screening I	no second screening	known screening II		g/l				
					< 2.6	2.6-2.8	2.8-3.0	3.0-3.2	⩾3.2
< 2.6	242	24	218	49.0	32.4	8.1	5.8	1.1	1.6
2.6-2.8	85	13	72	16.2	5.6	3.6	2.9	2.9	1.1
2.8-3.0	71	10	61	13.7	2.2	1.8	5.2	2.9	1.6
3.0-3.2	43	4	39	8.8	0.7	2.0	2.7	1.1	2.2
⩾3.2	60	5	55	12.4	0.7	1.3	1.3	2.7	6.3
Total	501	56	455	100.0	41.6	16.9	18.0	10.8	12.8
Numbers			Percentages						
column A	column B	column C	column D	column E	column F	column G	column H	column I	column J

0.2 % ≈ 1 person

screening II
mean 2.66 g/l
st. dev. 0.42

screening II - I
$\bar{V}$ 0.05 g/l

Column A: In this column the subdivision of the characteristic (e.g. serum cholesterol) has been expressed in groups (serum cholesterol percentage < 2.6 g/l; 2.6-2.8 g/l; etc.).

Column B: In this column the division in groups of all participants in screening I has been expressed in absolute numbers (e.g. the number of people that had a serum cholesterol percentage < 2.6 g/l etc. during screening I).

Column C: Here the division in groups has been expressed in terms of those participants in screening I who did not participate in screening II (e.g. the number of people that did participate in screening I but not in screening II and that had a serum cholesterol percentage < 2.6 g/l at screening I, etc.).

Column D: In this column the division in groups has been expressed as the absolute numbers of the participants in screening I and II.

Column E: In this column the frequency division of column D has been expressed in percentages. The total of column D has been expressed as 100 per cent.

Column F - J: In these columns the classification of the results of screening II in groups has been expressed in percentages of the total for every group formed during screening I for example, 49.0% of the participants in screening I and II had during screening I a serum cholesterol percentage < 2.6 g/l. This group divided during screening II into 32.4% still with a value < 2.6 g/l while 8.1% now had a serum cholesterol percentage of 2.6-2.8 g/l.

The results of screening I stated in the text regard people who participated both in screening I and in screening II (column F). All percentages have been calculated according to the formula described on page 62. This may have the consequence that the subtotal calculated according to this formula deviates to a slight extent from the summarized subtotal as a result of the addition of errors resulting from rounding off percentages.

Chapter VI

The results of the repeat screening


290
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230
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100
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170
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200
180
160

6.1 General

The average time elapsed between screening I and II was 19 months (standard deviation 4 months; minimum 11 months; maximum 32 months). It was found for no obvious reasons' that the older participants were the first to return for screening II.
In fact between the data of the individual examination and the age of the person examined an inverse correlation was found (screening I: correlation coefficient: — 0.66 $s < 0.001$; screening II correlation coefficient: — 0.41 $s < 0.001$). From this follows that any correlation that may be demonstrated could suffer from a certain bias which may make the results statistically speaking incorrect.

6.2 Anamnestic data

Chest pain

Of the 447 participants to screening II, 75 (16.8%) have stated both in screening I and II that they occasionally experienced chest pain (question B1, 2 and/or 3 answered with yes). The location of the pain was in 26.7% precordial both in screening I and II (annex 23). When climbing steps 36.2% had chest pain, when excited 34.2% and with sudden temperature changes 9%. Not one individual from this group had any postprandial complaints.

Hypertension

During screening II when asked whether the participants had been aware of arterial hypertension, 88.4% responded negative and 11.6% positive. Of these 52 participants (11.6%) in fact 37 were hypertensive at the time of screening II e.g. with an elevated diastolic blood pressure $\geqslant 100$ mm Hg, (phase IV). Twentysix participants said that they got no treatment in connection with the hypertension, 11 patients were prescribed a diet, 5 patients medication and 10 a combination of diet and medicines.

Smoking

The question "Have you ever smoked" has been answered affirmatively by 416 participants during screening I and II. Eleven participants (2.5%) answered on both occasions that they had never smoked. Several changes in the smoking

pattern between screening I and II were observed (annex 24). In 19.9% it was found at both screenings that cigarettes were no longer smoked, 5.8% indicated that they smoked more and 22.2% stated that they smoked less. No change in smoking pattern of cigarettes took place in 51.9% of the participants. During screening II, 5.0% of the participants stated that they smoked more than 20 cigarettes per day.

6.3 Biometric and biochemical data

The resting-electrocardiogram

The resting-electrocardiograms have been classified according to the criteria of the Minnesota Code. Following this classification a division has been made into five groups (annex 25).

- probable Ischemic Heart Disease (IHD) (column 68 code 1 or 2 or column 74 code 1);
- possible Ischemic Heart Disease (IHD) (column 68 code 3 or column 72 code 1, 2 or 3);
- slight ST or ST-J deviations (column 71 code 3 or 4);
- other deviations according to the Minnesota Code;
- no deviations.

The findings of the screening are given in table 6.1.

Table 6.1 Crosstabulation of the resting-ECG code (%)

screening I			screening II				
code	known screening II		code				
			0	1	2	3	4
0	197	45.9	33.8	9.3		2.1	0.7
1	176	41.0	8.4	28.9	0.2	2.8	0.7
2	1	0.2		0.2			
3	46	10.7	2.3	3.0		5.1	0.2
4	9	2.1	0.2			0.2	1.6
Total	429	100.0	44.8	41.5	0.2	10.3	3.3
Numbers		Percentages					

0.2 % ≈ 1 person

Code 0: no deviations
Code 1: other deviations according to the Minnesota Code
Code 2: column 71 code 3 or 4 (slight ST or ST-J deviations)
Code 3: possible Ischemic Heart Disease (IHD)
Code 4: probable Ischemic Heart Disease (IHD)

The total number of electrocardiograms that were classified comes to 429 (100%). Of the participants present at both screening I and screening II, 45.9% appeared to have no deviations according to the Minnesota Code during screening I, with screening II 33.8% had again no deviations, 9.3% showed other deviations, 2.1% possible IHD, and 0.7% probable IHD.

Possible IHD was found during the first screening in 10.7% of the participants. During screening II this group divided into 2.3% without deviations, 3.0% with other deviations, 5.1% with possible IHD and 0.2% with probable IHD.

The systolic blood pressure in rest

Systolic blood pressure measurements in rest are given in annex 26. At screening II the mean systolic blood pressure was found to be 3 mm Hg higher than at screening I.

The diastolic blood pressure in rest (phase IV)

The results of the determination of the diastolic blood pressure have been summarized in table 6.2.

The table suggests for all groups a higher diastolic blood pressure during rest. At screening I, 20.7% of the participants had a diastolic blood pressure equal to 100 mm Hg or over but at screening II, 38.9% of the participants were found to have this. At screening I, 2.9% had a blood pressure equal to 120 mm Hg or over. Half of this group still had a diastolic blood pressure equal to 120 mm Hg or over at screening II. Only 0.2% (1 participant) from this group had returned to normal values under 100 mm Hg at screening II. The mean diastolic blood pressure (phase IV) was during screening II 7 mm Hg higher than during screening I.

Table 6.2 Crosstabulation of the diastolic blood pressure in recumbent position (phase IV)

screening I			screening II							
mm Hg	results screening I	no second screening	known screening II		mm Hg					
					< 80	80-90	90-100	100-110	110-120	> 120
< 80	48	3	45	10.1	1.1	3.6	4.5	0.7	0.2	
80- 90	172	21	151	34.0	1.1	8.6	18.2	5.8	0.2	
90-100	171	15	156	35.1	0.7	3.6	15.1	11.5	3.6	0.7
100-110	68	10	58	13.1		0.2	3.4	7.0	1.8	0.7
110-120	25	4	21	4.7			0.7	1.8	1.4	0.9
> 120	17	4	13	2.9			0.4	0.4	0.9	1.4
	501	57	444	100.0	2.9	16.0	42.3	27.2	8.1	3.6
Numbers			Percentages							

0.2 % ≈ 1 person

screening II
mean 96 Hg
st. dev. 10

screening II - I
$\bar{V}$ 7 mm Hg

The diastolic blood pressure in rest (phase V)

At screening I and II, 51.4% and 36.0% respectively of the participants had a diastolic blood pressure under 90 mm Hg (phase V) (annex 27). A diastolic blood pressure between 80 and 90 mm Hg has been observed in screening I in 38.4% of the cases.
During screening II this group showed the following blood pressure levels:

2.9%: < 80 mm Hg,

15.7%: 80 - 90 mm Hg;

15.7%: 90 - 100 mm Hg;

4.0%: 100 - 110 mm Hg.

Body length

The results of the measurements of the body length are stated in annex 28.

Body weight

In annex 29 the results are given of the determinations of the body weight. On an average the weight has increased 0.3 kg.

Quetelet index

With the aid of the formula $W/L2 \times 10$ the relation between length en weight (Quetelet index) has been expressed. In this formula L represents the length in metres and W the weight in kilogrammes. The results have been given in annex 30.

Forced Expiratory Volume 1 sec. ($FEV_{1\ sec.}$)

As will be evident from annex 31 the average $FEV_{1\ sec.}$ was 2.52 litres (standard deviation 0.54) in screening II, which was 0.16 litres under the level of screening I.

Forced Expiratory Volume 5 sec. ($FEV_{5\ sec.}$)

In screening II the average $FEV_{5\ sec.}$ has been 3.48 litres (standard deviation 0.60) which was 0.25 litres under the level of screening I. Further data are given in annex 32.

Vital Capacity expiratory (V.C.)

The results of the determination of the Vital Capacity are rendered in annex 33. The average expiratory Vital Capacity was 3.67 litres in screening II (standard deviation 0.62) which was 0.31 litre under the level of screening I.

Peak Expiratory Flow Rate

The Peak Expiratory Flow (PEF) in screening I and II is given in annex 34. In screening I the average PEF amounted to 436 litres per minute (standard deviation: 89 l/m). As can be seen from annex 34 the average deviation between screening I and II was 3 l/m.

The chest roentgenogram

In annex 35 the findings have been expressed from the interpretation of the chest roentgenogram. In screening I emphysema (code 1) has been found in 22 cases (5.0%). In screening II this picture has been observed only once (0.2%) in these 22 participants. An analogous result has been found for code 3 (elongated aorta or prominent aortic knob). In screening I this picture was observed in 82 cases (18.6%), while only 16 of these 82 participants demonstrated this appearance again in screening II.

Haemoglobin

During screening I 95.5% of the participants had an Hb percentage between 8 mmol/l to 11 mmol/l; in screening II this amounted to 97.8%. A haemoglobin percentage below 6 mmol/l occurred in screening I in 0.2% and in screening II in 0.5% of those examined (annex 36).

Cholesterol

The results of the determination of serum cholesterol percentage of the blood are given in the following table.

Table 6.3 Crosstabulation of the serum cholesterol percentage (%)

screening I			screening II						
g/l	results screening I	no second screening	known screening II		g/l				
					< 2.6	2.6-2.8	2.8-3.0	3.0-3.2	⩾3.2
< 2.6	242	24	218	49.0	32.4	8.1	5.8	1.1	1.6
2.6-2.8	85	13	72	16.2	5.6	3.6	2.9	2.9	1.1
2.8-3.0	71	10	61	13.7	2.2	1.8	5.2	2.9	1.6
3.0-3.2	43	4	39	8.8	0.7	2.0	2.7	1.1	2.2
⩾3.2	60	5	55	12.4	0.7	1.3	1.3	2.7	6.3
Total	501	56	455	100.0	41.6	16.9	18.0	10.8	12.8
Numbers			Percentages						

0.2 % ≈ 1 person

screening II
mean 2.66 g/l
st. dev. 0.42

screening II - I
$\bar{V}$ 0.05 g/l

In screening I 21.2% of the participants had a serum cholesterol percentage of 3.0 g/l or over, in screening II this amounted to 23.6%. In screening I 51% had a serum cholesterol percentage over 2.6 g/l. In screening II these participants showed the following findings:

9% of the participants now had a serum cholesterol percentage of 2.6 g/l or lower, 28% remained on the same level or had a slightly lower serum cholesterol percentage while 14% had a higher serum cholesterol percentage during screening II than during screening I.
The average serum cholesterol percentage during screening II was 2.66 g/l (standard deviation: 0.42). It was 0.05 g/l higher than during screening I.

Total lipids

The average total lipid percentage amounted to 7.78 g/l in screening II (standard deviation 1.32), which was 0.19 g/l under the result of screening I. During screening I, 54% of the participants had a total lipid percentage under 8.0 g/l. At screening II, 58% had a total lipid percentage under 8.0 g/l. Both in screening I and in screening II 0.4% of the participants had a total lipid percentage of 12 g/l or over, although these were not the same participants. Details are given in annex 37.

Blood sugar

As is shown in annex 38 the average blood sugar percentage during screening II was 4.5 mmol/l (standard deviation 0.9), which brings it 0.2 mmol under that of screening I.
At screening I and II, 92.2% and 94.9% respectively of the participants had a fasting blood sugar below 5.6 mmol/l. During screening I, 1.7% had a fasting blood sugar percentage of 6.7 mmol/l or over. At screening II this was 1.2%. None of the people examined during screening I with a blood sugar percentage below 4.5 mmol/l (38.7% of the participants) had elevated values of 5.6 mmol/l or higher during screening II.

The glucose tolerance test

An oral glucose tolerance test (G.T.T.) has been performed each time the blood sugar percentage was 5.6 mmol/l or higher or a positive reduction of the urine was found. When an abnormal G.T.T. was found during screening I or pre-existed or the existence of diabetes mellitus was already known, no G.T.T. was carried out. The reasons for performing an oral G.T.T. are summarized in table 6.4.

Table 6.4 Reasons for performing an oral G.T.T. during screening I and II

	screening I	screening II	total
fasting glucose $\geq$5.6 mmol/l	20	8	28
positive reduction in urine	2	8	10
fasting glucose $\geq$5.6 mmol/l in combination with positive reduction in urine	5	2	7
total	27	18	45

As shown in the above table, the indication for performing an oral G.T.T. during screening I was in 25 out of the 27 G.T.T.'s a fasting blood sugar percentage $\geqslant$ 5.6 mmol/l. With 27 participants in screening I an oral G.T.T. was performed and with 18 during screening II which resulted in a two hour value $\geqslant$ 5.6 mmol/l. In these individuals no follow-up of the G.T.T. took place.

Table 6.5 Relation between the baseline percentage of the G.T.T. during screening I and the fasting blood sugar percentage in screening II

blood sugar percentage	baseline blood sugar percentage G.T.T.	fasting blood sugar percentage screening II	
		$<$ 5.6 mmol/l	$\geqslant$ 5.6 mmol/l
$<$ 5.6 mmol/l	14	14	0
$\geqslant$ 5.6 mmol/l	11	5	6
total	25	19	6

In table 6.5 the fasting blood sugar percentage during screening I is compared with the baseline percentage of the G.T.T. and the fasting percentage during screening II. The data show that at the time of the G.T.T. 14 out of 25 had a baseline blood sugar percentage $<$ 5.6 mmol/l. These 14 participants had during screening II also a fasting blood sugar percentage $<$ 5.6 mmol/l. In 11 participants a baseline blood sugar percentage $\geqslant$ 5.6 mmol/l was found. Six of these had during screening I a fasting blood sugar percentage $\geqslant$ 5.6 mmol/l.

The exercise test on the ergometer bicycle

The exercise test could be carried out at screening I and II in 430 participants. The respiratory frequency, cardiac frequency and systolic blood pressure during exercise in the last comparable minute are given in the tables 39, 40 and 41. There were no significant trends when the results of these items were compared during screening I and II.

The electrocardiogram during exercise

In table 6.6 the results of the exercise-ECG's are summarized. The exercise-ECG's are classified in 2 groups. One group includes the ECG's with an ST-segment depression of 1 mm or over during the exercise- and during the recovery phase. The second group includes the remaining ECG's (table 6.6).

Table 6.6 Crosstabulation of the exercise-electrocardiograms

screening I		screening II		
		⩾1 mm ST-depression		other characteristics incl. a normal exercise ECG
		during exercise ± during recovery phase	only during the recovery phase	
⩾1 mm ST-depression: during exercise ± during recovery phase	23	16		7
⩾1 mm ST-depression: only during the recovery phase	6		2	4
other characteristics incl. a normal exercise-ECG	401	11	7	383
total	430	27	9	394

During screening I in 29 of the 430 exercise-ECG's an ST-segment depression of 1 mm or over was seen, 23 times during the exercise and recovery phases, or only during the exercise phase and 6 times only during the recovery phase. During screening II this finding was again present in 18 instances. Of the 6 participants with abnormalities in the recovery phase 2 had these findings again during screening II and 4 now had no abnormalities. With screening II in 18 participants an ST-segment depression of 1 mm or more was observed. A complete left bundlebranch block was found twice, both in screening I and II and a rate dependent left bundlebranch block was found in screening II in one participant.

6.4 The results of the visits to 108 general practitioners

The visits to the general practitioners took place between the middle of August and November 1974. A distance of 4,386 kilometres has been covered by car in order to reach the general practitioners at their homes. The average length of the interview amounted to about 45 minutes. Of the 108 practising physicians who together provided 129 patients, 5 refused the interview. All these physicians lived within greater Rotterdam. The motivation for their refusal has been varied:

— "I consider it ethically unjustified to discuss my patients with an industrial physician";

— "I am too old to consider my opinion of any importance for you";

— "No time, you can screen as much as you like";

— "I don't want to waste any time on this";

— "Not interested".

The bulk of information has been collected from the remaining 103 general practitioners who took care of 122 patients.

The intervention policy carried out by the general practitioners

A letter with relevant patient information, found during screening I and II was sent to the general practitioner concerned. In total some 122 letters were sent to these doctors. These were received in 113 instances during screening I and during screening II in 110 cases. One hundred and twenty of the 122 patients had an obligatory health insurance. One hundred and fourteen of them had an health insurance policy with their general practitioner for more than 12 months.

A hundred and twenty two participants were advised to visit their doctor. It was found that only 72 of them in fact went to see their doctor. This happened in 68 cases because the participant decided to go and in 4 cases at the initiative of the general practitioner. The reason why they visited their physician varied. Hypertension was the cause in 11 participants, hypercholesterolemia in 43, an abnormal G.T.T. in 8, hypertension in combination with hypercholesterolemia in 4, hypertension in combination with an abnormal G.T.T. in 2, and hypercholesterolemia in combination with an abnormal G.T.T. in 4 participants.

The intervention measures have been analysed for each of these three items.

— **Hypertension**

In the 17 instances with hypertension treatment was given to 14. In 9 cases this was on the initiative of the general practitioner who in 5 patients consulted a specialist. In 3 cases no treatment was given because during the re-measurement by the general practitioner blood pressure was normal.In one instance a specialist stated that no treatment was necessary despite the existence of hypertension and once the general practitioner did no further examination. The treatment consisted in 6 patients of antihypertensive drugs, in 7 cases of a low salt diet and in 1 case of a combination of these. In 6 of the 14 patients the initial treatment program was subsequently changed. The follow-up of the patients with hypertension showed that 6 were controlled at least 4 times a year, 5 were seen at least 2 times a year and 1 once a year. Although he was given treatment one patient was not controlled at all and in one instance the control frequency could not be elucidated by the general practitioner.

— **Hypercholesterolemia**

The intervention policy could be analysed in 51 patients. Treatment was started in 34 patients, 30 times by the general practitioner, 3 times by a specialist and once by a dietician. In 17 patients no treatment was given at all. In 13 of these cases no re-examination of the serum cholesterol was carried out and in 4 cases again no treatment was begun in spite of confirmative re-examination results. The treatment given consisted in 24 cases of a cholesterol lowering diet, in 9 of a diet in combination with cholesterol lowering medication while in one the exact treatment could not be verified. In one patient the treatment program was changed when a cholesterol lowering medication was added to his diet. In 13 of the 34 patients with hypercholesterolemia regular follow-up and re-examination took place. Four of these were controlled at least 4 times a year, 7 at least 2 times and 2 at least once a year. Of 3 patients the follow-up frequency could not be established in the files of the general practitioners.

— **The Glucose Tolerance Test**

Of 14 participants with an abnormal G.T.T., 9 received treatment, 5 from the general practitioner, 4 from a specialist and in one case the physician had no information. In 4 cases no treatment was given. In 3 of these 4 no supplementary diagnostic measurements were performed while in one case the specialist advised not to treat the participant. The initial treatment consisted in 3 patients of the advice to reduce the sugar consumption in the diet and in 5 cases of a special diet in combination with oral hypoglycemics. In one case the manner of treatment could not be elucidated. Changes in treatment, a different kind of oral hypoglycemic, occurred for 2 participants. Systematic follow-up was carried out in 7 cases. In 3 at least 4 times a year, 2 at least 2 times a year and 2 at least once a year. One patient was not followed at all and in another patient the control frequency could not be established.

Opinions of 103 general practitioners concerning screening examination

Of the general practitioners visited, 85.5% consider the organization of large scale screening examinations to trace cardiovascular diseases in The Netherlands significant. A negative attitude towards this matter was encountered in 9.7%.
Of the physician 85.4% think that this screening ought to be done by screening teams, while 12.6% are of the opinion that the general practitioner is the right man to do so. The majority of the general practitioners (97%) think that they can follow and care for people who, during a screening examination would appear to have an increased risk to contract cardiovascular diseases. One general practitioner is of the opinion that it will be absolutely impossible for him to take care of the follow-up.

Eightyfive and a half per cent of the doctors expect a favourable influence on the physical health condition of the people with a cardiovascular screening examination every third year. A favourable effect on the mental health condition was expected by 69.9%. Of the general practitioners, 48.5% expect no change in the number of visits to their consulting hours when a cardiovascular screening examination would be performed every three years; 43.7% expect a higher attendance and 6.8% expect less busy consulting hours.

According to 93.2% of the physicians the decrease of the cardiovascular risk indicators in adults under 40 years will bring about a decrease in the chances on acquiring cardiovascular diseases. For the age groups 40-55 years, 55-65 years and 65 years and over this is 91.3%, 77.7% and 63.1% respectively. Only 5.8% of the general practitioners considered screening in their own practices possible for adults under 40, for the age groups 40-55 years, 55-65 years and $\geqslant$ 65 years these percentages were 8.7, 5.8 and 5.8 respectively. In 69.9% of the cases lack of time was given as the major reason that no screening can be performed. Other factors that play a part: too busy a practice (8.7%), inadequate knowledge of ECG's (6.8%), insufficient staff (5.8%).

Of the general practitioners visited, 17.5% own or have ECG equipment at their disposal, 22.3% claims to judge the ECG's themselves. When during a screening examination no abnormalities are found slightly over half of the general practitioners think that this should be told to the person examined by the screening team. In 38.8% the opinion was voiced that this ought to be done by the general practitioner himself. In the case of borderline deviations, these percentages are 20.4 and 77.7 respectively and for outright pathology 12.6 and 87.4 respectively. The replies to these questions were found to be consistent. When borderline deviations have been found 61.2% considered it acceptable when the screening teams give suitable advice while 36.9% consider this not acceptable.

A great many general practitioners feel the need to refer people to a cardiovascular screening team at their own request. In 46.6% this is frequently felt, 22.3% would do so occasionally and 30.1% claim to feel no need for this avail. Most of the general practitioners (92.2%) would appreciate information regarding a medication or a reference advice. In 7.8% no advice is needed. Extensive information is wanted in 42.7% while 57.2% would be content with concise information. The performance of screening examinations by an industrial health service was considered correct in 88.4%, only 7.8% objects against this. As reason for performing screening examinations by an industrial health service 39.8% considers the interest of man first, in 17.5% it was the interest of the employer and in 42.7% the opinion was given that both interests are of equal importance.

Favourable experiences with industrial physicians existed in 76.7% of the general practitioners. Not so favourable experiences were reported in 6.8%. The number of years that the general practitioners were practising actively were in 15.5% $\leqslant$ 5 years, 14.6%, 6 to 10 years, 22.3%, 11 to 15 years, 13.6%, 16 to 20 years, 13.6%, 21 to 25 years, 20.4% $\geqslant$ 26 years. The size of the practice was in 5.8% less than 2000 patients, in 16.5% 2000-2500 patients, in 15.5% 2500-3000 patients, in 27.2%, 3000-3500 patients and in 34.9% more than 3500 patients. Fourty seven general practitioners (45.6%) had additional functions. These additional functions demanded less than 4 hours per week for 19 physicians; for 12, 4 to 8 hours; for 9, 8-16 hours and for 7 more than 16 hours. There appeared to be no relation between the number of years that these physicians had been practising (question 42) and the size of their practice (question 38). Also the size of the practice or the number of years of experience appears to have no influence on the replies to questions 21, 23, 24.1, 25, 28, 32, 33, 34 and 41 (annex 20).

Physicians in practice for more than 26 years are slightly more often of the opinion that a three yearly screening (question 24.2) may have a negative influence on the mental health condition of the people than the younger physicians. There is no relation with the size of the practice. Four general practitioners with practices of more than 3500 patients, and who had been

practising over 16 years, were of the opinion that a decrease in the risk indicators would not decrease the chance of cardiovacular diseases in adults under 40.

Three physicians had no opinion in this matter and 96 expected a favourable effect (annexes 42 and 43). Physicians with smaller practices were more often of the opinion that they can screen adults under 40 themselves than the physicians with more comprehensive practices (question 27.1). For the other age groups (questions 27.2, 3 and 4) no differences can be demonstrated. The number of years of practising experience has no influence on the answering of question 27.

As the severity of the abnormalities found increases, more physicians, regardless size of their practice or their years of experience, are of the opinion that the doctor himself should inform the result of the screening examination to the person examined (annexes 44 and 45). When no special details have been found general practitioners with busy practices prefer that the results are told to the person examined by the screening team. Although physicians with one or more additional functions are generally older than physicians without additional functions a relation with the size of the practices could not be demonstarted.

Chapter VII

Discussion of the results

7.1 General overview and relevance of the investigation

Wilson and Jungner have summarized ten conditions which a screening examination, designed for early disease detection, must meet in principle (WHO, 1968; Whitby, 1974). In this chapter the results of this selective multiphasic screening will be discussed in relation to these prerequisites.

1. "The condition being sought should be an important health problem, for the individual and the community"

The results of epidemiologic research over the past decade to detect cardiovascular disease in the "industrialized" countries have emphasized the significance of this disorder for the community and the individual (Stamler, 1970; Lew, 1973; Blackburn, 1974; De Haas, 1975). Hypertension, smoking and an increased serum cholesterol percentage are risk indicators which increase the chances on contracting coronary heart diseases. In our population of 447 dockworkers about 30% of the participants had a systolic blood pressure $\geqslant$ 160 mm Hg and 39% a diastolic pressure $\geqslant$ 100 mm Hg. So hypertension is an important health problem in this population too. The same applies to smoking. Of the persons examined 422 said during screening I and/or II to smoke cigarettes, and 44.1% of them smoked more than 10 cigarettes per day. A serum cholesterol value $\geqslant$ 2.6 g/l is found in 58.4%. This information represents but the tip of the proverbial iceberg because it shows nothing about preclinical and clinical disease. In keeping with the first rule by Wilson and Jungner the screening fore the occurrence of cardiovascular diseases in older dockworkers can be classified as an activity which qualifies an important health problem both for the individual and for the community.

2. "There should be an acceptable form of treatment for patients with recognisable disease"

Since so far it has been impossible to identify one single cause for the origin of coronary heart disease, which implies that there can be no causal therapy. In stead, a number of risk indicators which considerably increase the chances on contracting coronary heart diseases have been identified. Of these, the major risk indicators are high blood pressure, smoking and an increased serum cholesterol percentage (Stamler, 1970; Froelicher, 1972; Blackburn, 1974). Since each of these 3 risk indicators can be modified, they should be of importance in the prevention of coronary heart diseases. Now how far has the evidence for "acceptable form of treatment or prevention" accumulated?

High blood pressure

The Veterans Administration Co-operative Study Group (1967, 1970) has demonstrated that effective treatment of patients with hypertension in the age group 40-60 years is possible. While the effect on reduction of cerebrovascular

stroke has been clear cut, the effect on coronary artery disease has been less convincing. Nevertheless, antihypertensive treatment is favourable in the view of CVD. However, it has appeared in practice that effective treatment is extremely difficult to sustain (Wilber, 1972[a], 1972[b]; Schoenberger, 1972). Analysis of the intervention policy in 24 participants who during screening I had a diastolic blood pressure $\geqslant$ 100 mm Hg (phase IV) both under resting conditions and during exercise, showed that only 17 of them went to their general practitioners. In 14 persons, treatment was given which consisted of antihypertensive drugs with or without a low salt diet. None of them had a diastolic blood pressure below 100 mm Hg at screening II. One of the reasons of the disappointing result may be that this form of treatment is unacceptable for those persons.

Smoking

About 7% of the participants who still smoked during screening I indicated during screening II that they did not smoke cigarettes anymore. However, 6% said to have increased the number of cigarettes daily smoked. The WHO expert Committee (1975) stated that: "cigarette smoking is an important cause of an increased risk of ischemic heart disease, contributing both to the atherosclerotic process itself and to the condition that precipitates a heart attack and determines a fatal outcome". "Smoking related diseases are such an important cause of disability and premature death in developed countries that the control of cigarette smoking could do more to improve health and prolonged life in these countries than any other single action in the whole field of preventive medicine".
Modification of the smoking habits can be done by motivating people to stop smoking, by reducing tobacco dosage and by reduction of the harmful components in tobacco smoke (WHO, 1975). Our results confirm that the actual "treatment" of smokers is very difficult and in this small series it proved impossible to modify the habit in a significant manner.

Increased serum cholesterol percentage

The significance of an increased serum cholesterol percentage for the development of atherosclerosis has been shown in many studies (Higgins, 1965; Stamler, 1970; Lew, 1973). There are indications that a decrease of the serum cholesterol percentage is accompanied by a decrease in the occurrence of coronary heart disease (Stamler, 1970; Evans, 1972; Miettinen, 1972; Blackburn, 1974).
Of 89 participants with a serum cholesterol level $\geqslant$ 3.0 g/l during screening I, 51 seeked the help of their physician. Treatment was started in 34 patients and consisted of a cholesterol lowering diet in combination with cholesterol lowering medication. In only 5 patients seen at screening II a decrease in serum cholesterol percentage to less than 3.0 g/l was noted.
Then there is the sobering fact that in the 38 persons who did not visit their general practitioner 18 had a lowering of the serum cholesterol to 3.0 g/l or less. It is not clear whether this result may be explained as a regression towards the mean or as a result of the general campaign to lower fat intake in The Netherlands.
It must be concluded that causal "treatment" of people with recognisable disease is not very rewarding, although lowering of the risk indicators is possible in principle and good evidence that it will decrease the CHD risk is available. Again unacceptability of the present form of treatment may be one of the explanations. Onother reason could be that the guidance and follow-up has not been sufficiently consistent or constant.

3. "The natural history of the condition, including its development from latent to declared disease, should be adequately understood"

It has been demonstrated that coronary risk indicators like hypertension, smoking and elevated serum cholesterol percentage increase the susceptibility to premature coronary heart disease (Froelicher, 1972; Blackburn, 1974). This relationship is cumulative in that with each additional step the total risk is increased. Furthermore the excess risk is proportionally greater for younger men (Stamler, 1970; Lew, 1973; WHO, 1975). Since reduction of blood pressure, cessation of cigarette smoking and lowering of the serum cholesterol percentage have been shown to lead to a reduced mortality rate from ischemic heart disease, the fact that natural history is not adequately understood formed one additional stimulus to conduct this (longitudinal) study.

4. "There should be a recognisable latent or early symptomatic stage"

In 1974-1975, the state of medical knowledge does not permit the recognition of latent disease, since most diagnostic tests fail in this respect. Only coronary artery arteriography could be considered as reliable in this regard and it is obviously not suited as a screening technique on a large scale, although it has been done in selected asymptomatic groups such as aircraft pilots (Froelicher, 1973). In the next paragraph the inadequacy of the next most frequently employed test for the determination of latent disease, the exercise test, is described consequently. One is forced to state that condition 4 cannot be met.

5. "There should be a suitable screening test or examination for detecting the disease at the latent or early symptomatic stage, and this test should be acceptable to the population"

When the consequences of atherosclerosis manifest themselves in the form of coronary heart disease, cerebrovascular or peripheral vascular diseases, extensive damage usually has already been done to these arteries and organs. An impression of the damage done to the heart can be obtained from the electrocardiogram, particularly during exercise. Simoons (1973) stated on the basis of a literature study that an ST-segment depression of 2 mm or more (0.2 mV) during exercise was accompanied in a very large proportion of the cases by obstructive coronary artery disease (specificity 98%). In most of these cases however the disease has reached the symptomatic stage. When the more readily found criterium of a 0.5 mm ST decrease was used as a limit, sensitivity declined to 83% and specificity to 67%. Follow-up data on 2,700 subjects who had had maximum stress tests showed that a positive test, characterized by ST-segment depression $\geqslant 1.5$ mm, predicted an incidence of a new coronary event of 9.5% a year, compared with 1.7% in those who had a negative test (Ellestad, 1975). Froelicher (1974) demonstrated in a follow-up study of 1,390 asymptomatic men that "maximal treadmill testing demonstrated a 60.9% sensitivity, 92% specificity and 20% probability that coronary artery disease would develop in a subject with an abnormal response. However, neither a normal test nor an abnormal test predict the future ominious presentation of coronary artery disease. In appropriate instances when the minimal risk of coronary angiography is justified, this invasive procedure can

determine the anatomic correlation of exercise induced ST-segment changes. While an important advantage of the electrocardiogram as a screening test is that it does not cause unacceptable discomfort even during exercise it does not give reliable information about the condition of the coronary arteries in asymptomatic individuals. Furthermore, since the effort and time involved are considerable, the exercise-electrocardiogram cannot be applied for mass screening. During screening I in 29 of the 430 exercise-ECG's an ST-segment depression $\geqslant$ 1mm was seen, 23 times during exercise and 6 times only during the recovery phase. During screening II this finding was again present on 16 of the 23 ECG's with abnormalities during exercise and/or recovery phase and in 2 of the 6 with only post exercise ST-segment depression. The follow-up time is too short to say anything about the prognostic value of our results but the data in the present study are consistent with the observations made elsewhere that condition 5 cannot be readily met.

6. "The facilities required for diagnosis and treatment of patients revealed by the screening programme should be available"

In order to investigate this aspect of the study the response of the medical community to the screening program was tested. Since the findings during screening I and II were reported in each case, the response of the general practitioner holds a key position in the delivery of medical care. About 70% of the people in The Netherlands are members of a sickfound and have to be inscribed in the list of a general practitioner. The general practitioner's response is therefore quite essential in evaluating the efficacy of screening programs. Most (85.5%) of the general practitioners interviewed considered the organization of a large scale screening effort by a screening team to trace cardiovascular diseases in The Netherlands significant. The majority of the general practitioners (97.7%) think that they can follow-up and care for people who are detected as having a positive risk during a screening. This expectation is in great contrast with the results of our intervention study. Lowering of blood pressure to normal levels was never reached and only rarely a lowering of the serum cholesterol level was achieved. Nevertheless 77.7% of the general practitioners state that they expect a favourable influence of the decrease of risk indicators in the age group 55-65 years on cardiovascular diseases. Although theoretically the general practitioners in The Netherlands are in the key position to effectuate lower risk indicators in high risk individuals, yet our study results do not concur with this theory.

7. "There should be an agreed policy on whom to treat as patients"

This prerequisite was most easily implemented. All participants of screening I were referred to their general practitioner when they had a diastolic blood pressure $\geqslant$ 100 mm Hg both during resting and exercise, a cholesterol percentage $\geqslant$ 3.0 g/l or a 2 hour G.T.T. value $\geqslant$ 5.6 mmol/l or a combination of these factors. For hypertension effective therapy with antihypertensive drugs is now possible (Veterans Administration Co-operative Study Group, 1967, 1970). It is also not controversial to recommend cholesterol lowering diets (Stamler, 1970; Evans, 1972; Miettinen, 1972; Blackburn, 1974). In chemical diabetes a diet low in sugar is readily prescribed since there is moderately strong evidence that treatment with tolbutamide or phenformin may be harmful (Klimt, 1970; Blackburn, 1974; Chalmers, 1975; Gilbert, 1975). However, each of these methods of treatment require a regular follow-up of the patients. Since it was found that only 72 out of 122 participants who received

the advice to visit their physicians in fact went to see their doctors, one wonders about the "agreed policy" however. In total these 72 participants had 82 abnormalities. Twentyfive of these abnormalities were not treated at all and in 7 not one follow-up took place. The "agreed policy" does not work at all in over one third of those screened to have definite abnormalities. Particularly the finding that during screening II all 17 found to have high blood pressure in screening I were still hypertensive was highly disappointing. Also only 13 patients out of 34 had regular follow-up and re-examination for their elevated cholesterol levels. Just five of them saw their serum cholesterol levels decline to below 3.0 g/l during screening II. Then there is the sobering fact that in 38 participants who did not visit their doctors 18 persons had "spontaneous" lowering of serum cholesterol to below 3.0 g/l. On the other hand of the 14 persons with an abnormal G.T.T. 9 received treatment. There the need for treatment and follow-up was best understood and accepted by the general practitioners. These results emphasize the findings of Wilber (1972b) that while in principle there excists good agreement about whom to treat, practice demonstrates otherwise if not the opposite.

8. "Treatment at the pre-symptomatic, borderline stage of a disease should favourably influence its course and prognosis"

As the results of the literature survey show, treatment of hypertension and hypercholesterolemia favourably influences CHD risk. The same applies to the reduction of smoking (Veterans Administration Co-operative Study Group, 1967, 1970; Stamler, 1970; Evans, 1972; Miettinen, 1972; Blackburn 1974; Doll, 1974; WHO, 1975). In the present study the mean follow-up time was only 19 months. In this short time no meaningful morbidity or mortality analysis can be carried out. Prerequisite 8 remains unfulfilled.

9. "The cost of case-finding (which would include the cost of diagnosis and treatment) needs to be economically balanced in relation to possible expenditure on medical care as a whole"

An impression of the cost of case-finding may be obtained from the following figures:

	per examination	**total**
Screening I: 1971		
cost of a single examination	Hfl. 260.—	
loss of productivity during a half working day of a participant	Hfl. 75.—	
	+	
costs per active participant	Hfl. 335.—	
number of examinations: 503		Hfl. 168,505.—

Screening II: 1974

cost of a single examination	Hfl. 340.—	
loss of productivity during a half working day of a participant	Hfl. 90.—	
	+	
costs per participant	Hfl. 430.—	
number of examinations in working participants: 327		Hfl. 140,610.—
number of examinations in inactive participants: 120		Hfl. 40,800.—
		+
		Hfl. 181,410.—

The WHO (1975) states about smoking "It should be kept in mind that economic cost-benefit studies are not conclusive, since the true gain from reducing smoking will be in human terms and in the reduction of ill-health and of premature death, rather than merely in mortality terms". This can also be stated for the other risk indicators while no clear cut answer can be given to this prerequisite the cost per examination seems to be reasonable if not "economically balanced". However when one considers the total number of patients in whom one or more abnormalities exist and in whom no follow-up was done and one divides these costs into the small number in whom intervention did result the costs per positive screening intervention rise considerably. In fact they then may be considered to be prohibitive. E.g. the costs of 447 serum cholesterol determinations during screening I were Hfl. 5,587.50. There were 89 positive findings. This makes Hfl. 62.78 per positive finding. Only 5 of them had an "effective" treatment. This results in Hfl. 1,117.50 per "effective" treatment. This is of course a "tongue in cheek" calculation.

10. "Case-finding should be a continuing process, not a "once and for all" project"

The fact that new cases were found during screening II demonstrates the need for a continued effort in order to achieve optimal health care for older dockworkers. Despite the disappointing results of the intervention policy thus far, every effort must be made to achieve better co-operation between screening team, general practitioner and patient.

All ten prerequisites of Wilson and Jungner taken together, screening I and II "make the grade". Investigations to detect the occurrence of cardiovascular diseases are activities qualifying an important health problem, both for the individual and for the community. While the presymptomatic stage is not recognisable with the screening tests used, the risk indicators accelerating the disease, e.g. hypertension, hypercholesterolemia and smoking can be identified. Treatment of patients with these risk indicators favourably influences the course and prognosis of the cardiovascular diseases. Despite the — up to now — desillusioning intervention results and notwithstanding the mounting costs the fact that new cases were found during screening II indicates the need to continue screening with particular emphasis on more systematic treatment and follow-up facilities.

7.2 Details of the repeat screening

When the results of screening I and II are compared in an individual case attention must be given first to interlaboratory and next to interobserver differences. During a pilot study conducted to compare the results of the serum cholesterol and blood sugar determinations in our laboratory with those determined at the reference laboratory, the Gaubius Institute of the department of Biochemistry in Leyden University, it was found that there were no differences of major or practical significance.

Higgins (1965), Rose (1965) and Elgrishi (1969, 1970) have made it clear that the description and interpretation of resting-ECG's, even when a standardized protocol is followed, provides no guarantee for the avoidance of intra- and interobserver differences. Re-classification of the 927 resting-ECG's of screening I and II by one trained observer has confirmed these findings. Details of these discrepancies are given in table 7.1.

Table 7.1: Results of the initial and re-classification of the resting-ECG's conform the Minnesota Code (%)

initial classification			reclassification				
code	N	%	code 0	code 1	code 2	code 3	code 4
0	407	43.9	37.0	6.8		0.1	
1	357	38.5	5.2	32.6	0.1	0.4	0.2
2	3	0.3		0.1	0.1	0.1	
3	124	13.4	2.3	1.2		9.9	
4	36	3.9	0.5	0.6		0.5	2.3
total	927	100.0	45.0	41.3	0.2	11.0	2.5

The data in table 7.1 indicate a considerable shift within all groups after re-classification. These shifts probably are caused by some improvement and possibly more accurate measurement by the observer. Comparison in a test group of the code of the re-classification of every tenth resting-ECG with the code of a third classification made by another trained observer shows that there was now agreement in only 76.8% of the cases.

From table 6.1 it may be concluded that in the short period between screening I and II, no large changes occurred in the resting-ECG's in this group of dockworkers and that code 2 — slight ST or ST-J depression — occurs in this population so rarely that it in fact may be deleted.

Particularly since its prognostic value is limited, caution must be exercised when advice is given on basis of these resting-ECG findings (Rose, 1971).

Blood pressure

The mean systolic blood pressure in all 447 individuals during screening II is 3 mm Hg higher than that during screening I. The diastolic blood pressure in phase IV is 7 mm Hg higher and in phase V 5 mm Hg higher. The protocol used defines the diastolic blood pressure as the lowest pressure of two observations made by one observer during screening I and by two observers during screening II. The observers were not the same in screening I and II. The differences in diastolic blood pressure between screening I and II are probably mainly caused by interobserver differences and only partly related to age (Lew, 1973). Of 24 participants with a diastolic blood pressure (phase IV) $\geqslant$100 mm Hg during screening I the intervention policy was looked at. It was found during screening II that despite treatment in 14 of the 24 individuals all still had a diastolic blood pressure $\geqslant$100 mm Hg. These data justify the conclusion that the intervention policy whenever followed, has not resulted in a decrease of this particular risk indicator and that whatever differences were found must be ascribed to interobserver variations.

Chest roentgenogram

The follow-up results of the chest roentgenograms are equally disturbing. Since the incidence of emfysema (code 1) and "elongated aorta" (code 3) are reversed, it is likely that the classification system is of little value. This time interobserver differences can be excluded as a cause since the observers during screening I and II were the same. Despite a double reading system intraobserver variation must be the main reason for the discrepancies. The chest roentgenogram may well be omitted in future screening efforts when used as a comparative tool.

Haemoglobin

A haemoglobin percentage below 6 mmol/l occurred in 0.2% and in 0.5% during screening I and II respectively. Medalie (1973) also observed in only 17 (0.17%) out of 10,000 men over 40 years haemoglobin value below 6.2 mmol/l. Again this determination appears to have little value in a screening program for an all malle population.

Cholesterol

In spite of the recommendations given on the basis of screening I the mean serum cholesterol remained at the same level. Actually the value has the same level as found by Karvonen (1959), Johnson (1965), De Wijn (1972) and May (1974) in their studies in different populations. Only in a few instances a decrease of this risk indicator could be ascribed to the intervention study.

Smoking

De Haas reported in 1973 a decrease in the number of cigarette smokers in The Netherlands male population. This was also found in this study carried out over the same period. The percentage of non smokers increased from 21.3% during screening I to 27.3% during screening II and 22.2% of the participants declared that they smoked less. Although these changes are statistically hardly convincing they may indicate a trend. It is likely that this trend was encouraged by several measures taken in the country as a whole rather than by the efforts of the screening team or physicians, as the latter did not make a specific effort at counseling against smoking.

Glucose tolerance

In view of the limited therapeutical possibilities and the not clearly demonstrated preventive effect of treatment in individuals with an asymptomatic diabetes mellitus this test has little importance at the present time. The lack of definite boundaries between normal, borderline and pathological values for glucose tolerance adds to the difficulties. In table 7.2 the results of the G.T.T. are classified in percentile groups (annex 6), as shown 24 participants with a fasting blood sugar $\geqslant$ 5.6 mmol/l.

Table 7.2: Classification of G.T.T.'s during screening I (annex 6).

total n = 24 *					
general practitioner - participant contact (n = 13)					no general practitioner - participant contact (n = 10)
	percentile	n	treatment	control	n
Abnormal	< 1.0	3	2	2	1
	1 - 5	1	1	1	-
Borderline	6 - 10	1	1	1	1
Normal	11 - 20	-	-	-	-
	21 - 30	2	2	2	1
	31 - 40	1	-	-	1
	> 40	5	3	1	6
Total		13	9	7	10

* In one case the general practitioner had no additional information.

It can readily be seen from this table that 16 out of the 24 G.T.T.'s provide values "normal" for their age according to the recommendations of Andres (1971). Given these meager results it may be advisable to omit this screening test for glucose tolerance from a cardiovacular screening program. If such a test were still to be desired the following advice can be formulated: determine the blood sugar 2 hours after ingestion of 50 g sugar as an initial screening test for glucose tolerance (Teuscher, 1971; West, 1971). All participants with a score below a certain percentile level (e.g. percentile 10) should then be submitted to a standardized 50 g oral G.T.T. (annex 5). For the interpretation of the results the tables given in annexes 5 and 6 may be utilized. However, with Andres (1971) it may be concluded that "Until it is clear exactly what level of test performance truly carries with it increased risk, and until it is clear that prophylaxis is possible and that therapy is helpful, it behooves us to adopt a conservative stand at the moment in our willingness to classify a middle-aged or older subject as diabetic on the basis of poor test performance alone".

The exercise test

During exercise testing there were no large differences between the populations in screening I and II regarding cardiac frequency, blood pressure and respiratory frequency. During screening I 29 participants appeared to have an ST-segment depression $\geqslant$ 1 mm. These findings were again found during screening II in 18 of the 29; in the remaining 11 participants the abnormality was not observed during the repeat test. Simoons (1973) has found analogous results in literature. Again these data urge to great caution as to the significance of ST-segment abnormalities during a single exercise test when no complaints coexist.

7.3 Visits to the general practitioners

Although the results of these interviews cannot be regarded as representative for all Dutch general practitioners, it was encouraging to see in the majority of the tested group a positive attitude towards mass screening on cardiovascular diseases. This positive attitude manifested itself in the expectation they demonstrated regarding the influence of regular screening on the physical and mental health conditions of the persons examined. In fact a favourable effect on physical health is expected by 85.5% and on mental health by 69.9% of these 103 physicians. By far the greater part of the general practitioners presumes that the influence of decreasing risk indicators will be greater on younger people than on older people. Nevertheless 63.1% are of the opinion that a decrease of the risk indicators will also have a favourable influence on people over 65. It became evident that the physicians are not able to carry out a periodical screening examination themselves, mainly due to lack of time. Over 60% care for more than 3000 patients and cannot readily accept extra duties. The majority should appreciate the information provided with an advice on medication or referral policy. As regards the communication of the results of a screening examination, 87.4% wish to tell their patients themselves the type of abnormality found. When borderline abnormalities exist, this percentage still is 77.7%. When no abnormalities are found 58.3% voiced no objection that the screening team informs the patient directly.

7.4 Reflections on the role of the general practitioner

Generally speaking, the major risk indicators, hypertension, smoking and hypercholesterolemia identified in this population, were not accompanied by complaints. The only motivation provided to participants for a visit to their general practitioner was the statement that the individual had an increased chance for contracting or having a cardiovascular disease. This "increased" chance is possibly not strong or threatening enough to change a style of life that has been customary for many years. It may even not be enough stimulus to consult a doctor. The participants in fact had to take a number of decisions to remain under continue medical care. The first decision was to go or not to go to his physician when the results of the screening are already known. Many people opted for the least bothersome solution, which is not to go. Secondly, when a general practitioner/participant contact had been realised in most cases continued control proved desirable. Again for every visit to his physician the participant had to take another initiative. Add to this the varied

responses by the physicians and it is little wonder that so little follow-through took place. The system can be improved possibly by a much enhanced co-operation between screening team and general practitioner. The screening team should take the initiative for periodical screening. Patient information accompanied by specific advice is then sent to the general practitioner, without informing the patient. The participant must then go to his own physician to obtain the results of the examination. When abnormalities are found the screening team should handle administrative and medical/technical matters, provide for a regular follow-up, letting the general practitioner adapt his treatment on basis of data provided by the team. Advantages of this system are that more participants with abnormalities will consult their physician since they want to know the result of the examination while the follow-up of patients will be more regular. The only alternative is to place the entire screening, follow-up and treatment aspects of such populations in the hands of a single team. This may well be the only effective solution with the lowest cost-benefit ratio if a large screening and (intervention) effort is to be made in The Netherlands.

Chapter VIII

Conclusions

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8.1 General

Four groups of conclusions can be made on basis of this study:

1. Conclusions concerning the prevalence of risk indicators and other abnormalities in the population of 447 dockworkers in screening I and II.

2. Conclusions about the efficacy of the screening methods and tests used.

3. Conclusions regarding the efficiency of the intervention policy.

4. Conclusions relating to the attitudes of the 103 general practitioners regarding mass screening, industrial medicine and communication.

8.1.1 Conclusions concerning the prevalence of risk indicators and other abnormalities in the population of 447 dockworkers in screening I and II

In general there were no major changes in the biometric and biochemical data in the short follow-up period between screening I and II. An exception was the diastolic blood pressure level in rest. During screening II the mean diastolic pressures phase IV and V were 7 mm Hg respectively 5 mm Hg higher than during screening I. These differences are probably mainly caused by inter-observer differences and do not reflect an actual increase in blood pressure. The percentage of cigarette smokers decreased from 78.7% to 72.7% while 22.2% of the participants declared that they smoked less. These data may indicate a trend but it can hardly be ascribed to this in the previous study. However, the new abnormalities found during screening II justify a continuation of the screening program despite the costs involved.

8.1.2 Conclusions about the efficacy of the screening methods and tests used

Blackburn stated in 1974 that only three data are required for the prevention of CVD. These data are the level of blood pressure, details on the smoking habit and the level of serum cholesterol. All other tests are of minor importance. Our methods and tests also lead to the conclusion that while the "COPIH" questionnaire provides useful information concerning changes in smoking habits and the determination of the serum cholesterol and the blood pressure are sensible, all other tests such as the determination of the haemoglobin and the test for diabetes mellitus, as well as chest roentgenograms may be omitted. Repeated reading of all resting-ECG's has made it evident that comparison of ECG's in a follow-up study even when a standardized protocol is used, is only justified when only one observer is employed. When such interobserver differences are avoided, no marked changes were found to have occurred between the resting-electrocardiograms in the short period between screening I and II. Code 2 (slight ST or ST-J depression) occurs in this population so rarely

that it may be deleted. Comparison of the exercise-ECG's during screening I and II shows that an ST-segment depression $\geqslant$ 1 mm during screening I in about one third of the cases could not be demonstrated during screening II. This leads to great caution in advising patients when during a single exercise test no complaints coexist with ST-segment abnormalities.
The visits to the general practitioners provided a lot of relevant information. Most of these data show that the general practitioner is not very well informed or not very well equipped to deal with data obtained from present day screening and intervention activities.

8.1.3 Conclusions regarding the efficiency of the intervention policy

The intervention policy in regard to hypertension (diastolic blood pressure phase IV $\geqslant$ 100 mm Hg during rest and exercise) and hypercholesterolemia (serum cholesterol $\geqslant$ 3.0 g/l) seems to be completely ineffective. During screening I 24 patients with hypertension were referred to their physician. None of these had, during screening II, a diastolic blood pressure $<$ 100 mm Hg. Either the recognition or the treatment of the arterial hypertension failed. Of 89 patients with hypercholesterolemia, 51 visited their doctor, but only 5 of them had during screening II a serum cholesterol reduced to below 3.0 g/l. On paper there appears to be an agreed policy on whom and how to treat as patients but in practice this policy does not exist at all.

8.1.4 Conclusions relating to the attitudes of the 103 general practitioners regarding mass screening, industrial medicine and communication

The majority of the general practitioners visited exhibited a positive attitude towards mass screening on CVD. Nevertheless, far the greater part of them (97.0%) think that they can follow and care for people who are found to be at risk during screening. About two thirds of these physicians were of the opinion that a decrease of the risk indicators in men over 65 years would have a favourable influence on CVD. Also 69.9% of them expected a favourable effect of CVD screening on the mental health of men. In 76.7% there existed favourable opinions on industrial physicians and only 17.5% of these doctors indicated that they thought the employers interest came first during these screening investigations. Most of the general practitioners (92.2%) would appreciate information regarding medication or referral. Yet, despite all these favourable omens practical implementation of the given advice hardly existed.

Samenvatting

Samenvatting

In 1974 schreef Blackburn: "De huidige ontwikkeling op het gebied van de epidemiologie van hart- en vaatziekten heeft aangetoond dat er enorme verschillen bestaan in het vóórkomen van ischaemische hartziekten tussen populaties en dat de kans op het krijgen van de ziekte afhankelijk is van de individuele of gemeenschappelijke risico-indicatoren . . . De benaderingswijze, waarin de kwantitatieve beoordeling van de risico-indicatoren de voorkeur heeft boven de kwalitatieve, zal zich evenals de preventief geneeskundige aanpak van de hart- en vaatziekten voortzetten . . . De medicus practicus zal de vele op zichzelf matig belangrijke risico-indicatoren en slechte gewoontes niet langer als onbelangrijk beschouwen, maar ze zien als een belangrijke gecombineerde risico-indicator die effectief optreden vereist . . . Preventief optreden is vooralsnog het enig mogelijke; de preventieve geneeskunde dient haar eigen aandeel te krijgen; dit houdt meer in — en ik verwacht dat we het daar nu over eens kunnen zijn — dan alleen maar praten".

Enkele jaren voor deze uitspraken, en wel in 1971, is op de Bedrijfsgeneeskundige Dienst voor de Haven van Rotterdam een gestandaardiseerd onderzoek begonnen naar het voorkomen van hart- en vaatziekten bij havenwerkers van 55 tot 65 jaar. De resultaten van dit eerste onderzoek zijn door Baart in 1973 gepubliceerd. Een tweede onderzoek bij dezelfde havenwerkers is uitgevoerd tussen oktober 1972 en november 1973. In aanvulling hierop is het interventiebeleid nagegaan dat een aantal huisartsen hebben gevoerd bij deelnemers met afwijkende bevindingen, aangetoond bij onderzoek I. Deze onderzoeken vormen de basis van dit proefschrift.

De vijfhonderd en drie deelnemers aan onderzoek I werden uitgenodigd aan onderzoek II deel te nemen. Vierhonderd zeven en veertig mensen hebben daadwerkelijk aan deze uitnodiging gehoor gegeven. Het onderzoek bestond uit het met behulp van een gestandaardiseerde vragenlijst verzamelen van een aantal anamnestische gegevens, het meten van de lichaamslengte en het gewicht, de bloeddruk, een electrocardiogram opgenomen tijdens rust en inspanning, een thoraxfoto, de bepaling van het serum cholesterol- en het totaal lipidengehalte, de bloedbezinkingssnelheid en een aantal ventilatoire longfunkties. De onderzoekresultaten geven niet alleen informatie over het voorkomen van risico-indicatoren op twee verschillende tijdstippen, maar bieden tevens de mogelijkheid de gebruikte onderzoekmethoden op waarde te schatten.

Een speciaal onderzoek werd uitgevoerd teneinde inzicht te verkrijgen in de doelmatigheid van het door de huisartsen gevoerde interventiebeleid op basis van gegevens, die tijdens onderzoek I door het screeningsteam aan hen zijn verstrekt. Gedurende de persoonlijke interviews met ieder der 103 huisartsen, die bij dit onderzoek waren betrokken, werd voornamelijk aandacht geschonken aan de behandeling van mensen met een verhoogde bloeddruk, een verhoogd serum cholesterol gehalte of een gestoorde glucose tolerantie test.
De gegevens zijn, evenals die van onderzoek II, bewerkt op de afdeling Biostatistica van de Erasmus Universiteit te Rotterdam.

De deelnemers aan onderzoek II verschenen gemiddeld 19 maanden na

onderzoek I. De resultaten wekken de indruk dat het aantal sigarettenrokers in die tijd is afgenomen. Daartegenover staat dat het gevoerde interventiebeleid met betrekking tot hypertensie en hypercholesterolaemie volslagen ontoereikend blijkt te zijn. Het literatuuronderzoek en de eigen onderzoekresultaten maken het voorts aannemelijk dat het inspannings-ECG en het bepalen van de glucose tolerantie geringe betekenis hebben bij screeningsonderzoek van grote groepen. Grote voorzichtigheid blijkt ook gewenst te zijn bij het geven van adviezen over de mogelijkheid van het bestaan van hartziekten aan mensen zonder klachten, bij wie ST-segment afwijkingen zijn gevonden tijdens een inspanningsonderzoek.
De meeste gegevens, die bij de bezoeken aan de huisartsen zijn verzameld, geven aan dat de artsen in het algemeen niet goed geïnformeerd zijn over de noodzaak van preventie en dat zij niet goed uitgerust zijn om slagvaardig op te treden naar aanleiding van de verstrekte gegevens.

Als conclusie kan gesteld worden dat voor de preventie van ischaemische hartziekten op dit moment slechts drie risico indicatoren van groot belang zijn. Dit zijn hoge bloeddruk, (sigaretten) roken en een verhoogd serum cholesterol gehalte in het bloed. Daar er tot op heden geen testen beschikbaar zijn om op grote schaal ischaemische hartziekten in een vroeg stadium op te sporen, dient veel aandacht geschonken te worden aan het verlagen van deze drie risico indicatoren. Gezien de teleurstellende ervaringen met de doelmatigheid van het bestaande medische systeem worden een aantal stappen aangegeven, die tot verbetering zouden kunnen leiden.

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Annexes

ANNEX 1 *CHAPTER II*

RESULTS OF RESEARCH IN THE FIELD OF SUGAR METABOLISM

	selection	sugar load	investigation scheme	medium	technique	criteria
University group diabetes program (Klimt, 1970)	O.G.T.T.	30 gm glucose	0, 1, 2, 3, h	venous blood	Hoffman ferricyanide method autoanalyser	Sum G.T.T. $\geqslant$ 500 mg %
Diabetes among middle aged male civil servants (Reid, 1974)	O.G.T.T.	235 ml '' Lucosade'' equivalent to 50 gm anhydrous dextrose	2 h	capillary blood	ferricyanide method autoanalyser	$\geqslant$ 200 mg %
A method for the epidemiologic study of early diabetes (Rand, 1974)		no standardized meal	$1\frac{1}{2}$ h	capillary blood	Kaufman Grant and Moorhouse autoanalyser	$\geqslant$ 120 mg %
Current status of hypertension. Control in an industrial population (Schoenberger, 1972)	O.G.T.T.	50 gm glucose	1 h	plasma	?	?
Kontrolluntersuchungen nach einer diabetes Feldstudie bei berufstätigen eines chemischen Grossbetriebes (Orth, 1972)	O.G.T.T.	50 gm glucose	12 h	urine	enzym teststrip	color change
Ischemic heart disease study Vlagtwedde 1970 (May, 1974)	O.G.T.T.	100 gm glucose	$\pm$ 130 min.	capillary blood	ferricyanide autoanalyser	$\geqslant$ 160 mg %
COPIH	fasting blood sugar	-	-	venous blood	orthotolui-dine method	$\geqslant$ 100 mg %

ANNEX 2 *CHAPTER II*

DEFINITIONS OF DIABETES MELLITUS AND RELATED STATES 1)

Potential diabetics

These are persons in whom diabetes may be prognosticated with reasonable reliability. They respond normally to a glucose tolerance test (G.T.T.) 2), but there is a clear risk of their developing diabetes. Potential diabetics include:

(1) The identical twin of a diabetic;

(2) A person with both parents diabetic;

(3) A person with one diabetic parent whose other, non-diabetic, parent has or had a diabetic parent, sibling, or offspring, or a sibling with a diabetic child;

(4) A woman who has given birth to a live or stillborn child weighing 4.5 kg or more at birth 1), or to a stillborn child showing hyperplasia of the pancreatic islets not due to rhesus incompatibility.

Latent diabetics

(1) A person in whom the G.T.T. has produced a normal result but who is known to have been diabetic according to the G.T.T. at some time during pregnancy, during infection, when under some other stress, or when obese.

(2) A person who has abnormal blood-glucose responses (similar to those found in diabetes mellitus) to provocative tests, such as the cortisone-augmented G.T.T. (The Committee considered that these tests should at present be largely confined to research).

Asymptomatic (sometimes referred to as subclinical or chemical) diabetics

(1) A person with a diabetic response to the G.T.T. whose fasting true blood-sugar is below 130 mg/100 ml (capillary) or 125 mg/100 ml (venous).

(2) As above, but with fasting true blood-sugars above the stated values.

Clinical diabetics

A person with an abnormal response to the G.T.T. and with the symptoms or complications of diabetes.

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1) Derived from: Fitzgerald, M.G. & Keen, H. (1964) *Lancet*, 1, 1325.
2) See page 9 for the Committee's views on glucose tolerance tests.

W.H.O., 1965.

ANNEX 3 *CHAPTER II*

STAGES IN THE NATURAL HISTORY OF DIABETES MELLITUS

Terminology by: University of Michigan	Prediabetes	⟷ Subclinical diabetes	⟷ Latent diabetes	⟷ Overt diabetes
World Health Organization	Potential diabetes	Latent diabetes	Asymptomatic diabetes (subclinical or chemical)	Clinical diabetes
Fasting blood sugar	Normal	Normal	Normal or ↑	↑
Glucose tolerance test (GTT)	Normal	Normal Abnormal during pregnancy, stress	Abnormal	Not necessary for diagnose
Cortisone-GTT	Normal	Abnormal	Not necessary	– – – –
Delayed and/or decreased insulin response to glucose	+	++	+++	++++
Vascular changes	?+	++	+++	++++

Fajans, 1973.

ANNEX 4 *CHAPTER II*

STANDARDIZATION OF THE ORAL GLUCOSE TOLERANCE TEST.

Report of the Committee on statistics of the American Diabetes Association June 14, 1968.

7. Summary of recommendations for standardized oral glucose tolerance test

I. Preparatory Phase

A. Diet: Intake of at least 150gm. of carbohydrate per day for three days preceding test, if the patient has been on a normal diet previously.

B. Acute Illness: Delay of at least two weeks after period of acute illness before performing test.

C. Medication: Discontinuance of drugs proven or believed to influence the GTT, including hormones, oral contraceptive drugs and hypoglycemic agents, for at least three days prior to test.

D. Fasting Period: No intake of any food value for at least eight and not more than sixteen hours preceding the test.

E. Miscellaneous Restrictions: Avoidance of coffee, smoking and unusual physical exercise for at least eight hours prior to the test.

F. Postponement of Test: Omission of test in event of unexpected illness (fever, gastritis, etc.), or if there has been ingestion of food within eight hours.

II. Testing Phase

A. Time: Conduct test between 7 a.m. and 12 noon, i.e., take fasting specimen between 7 a.m. and 9 a.m.

B. Glucose Load: Administer in dose of 40 gm. per square meter of body surface diluted to a volume of 300 ml. and consumed within five minutes after obtaining fasting blood specimen.

C. Specimen Timing: Draw antecubital venous blood specimen at fasting. Note time zero when the patient starts drinking the glucose. Draw additional blood specimens exactly 60.120 and 180 minutes after time zero (30, 90 en 150 minute specimens may be obtained for additional definition of the GTT-curve).

D. Patient Behaviour: Have patient avoid physical exertion, emotional stress and stimulants (tobacco, alcohol, coffee, tea.).

III. Processing of Specimen

A. Type of Sample: Plasma or serum are preferable to whole blood. Separation by centrifugation should be performed within thirty minutes.

B. Preservation of Sample: Freezing or addition of sodium EDTA (1 mg. per ml. of blood) and sodium fluoride (2 mg. per ml. of blood) are required if chemical determination is not performed on the same day the specimen was drawn. Thymol must not be present during the color development phase of the chemical test.

C. Chemical Method: The glucose oxidase (not usable if sodium fluoride is present). Nelson-Somogyi and AutoAnalyzer (Hoffman's ferricyanide) methods are all acceptable. The importance of primary standards and reference sample determinations with every run is stressed.

IV. Interpretation of Test Results.

A. Reporting: Wherever possible, all four plasma glucose levels should be reported (i.e., fasting, 1, 2, and 3 hour levels).

B. Diagnosis) Individual or grouped data should be classified into "diabetic" and "nondiabetic" according to each of the following criteria and reported accordingly:

1) The Wilkerson Point Method (adjusted for plasma glucose and 40 $gm/_{m}2$ glucose load)

Time		mg. per 100 ml		Points
Fasting	—	150 or more	=	1
1 hour	—	195 or more	=	½
2 hour	—	140 or more	=	½
3 hour	—	130 or more	=	1

Two points or more indicate diabetes.

2) The Fajans-Conn Criteria (adjusted for plasma glucose and 40 $gm/_{m}2$ glucose load). 1 hour 185 or more, 1½ hour 165 or more and 2 hour 140 or more = diabetes. The test should be reported even if the 1½ hour determination is omitted.

3) Summation of Fasting 1, 2 and 3 hour plasma glucose levels. If the sum is 600 or more a diagnosis of diabetes is made.

4) Other methods at the author's discretion.

ANNEX 5 *CHAPTER II*

ORAL GLUCOSE TOLERANCE TEST (GTT): STANDARD TEST WITH 50 GRAMS OF GLUCOSE (TRANSLATION).*

The generally accepted method for the diagnosis of a diabetes patient in an early stage is the GTT. Although its incomplete reproducibility has invoked criticism, the GTT still is recommended with numerous modifications. As the GTT varies in its applications between specialists, general practitioners and hospital physicians, the standard stress test with 50 grams of glucose during two hours, as recommended by the study group of the European Diabetes Association, appears to be efficient for the time being.

Indications:

- fasting and/or postprandial borderline blood glucose concentrations;
- clinical suspicion in absence of elevated fasting and/or postprandial blood glucose, such as could occur with arterial circulatory disturbances, overweight or diabetes in the family;
- every glucosuria even in trace amounts with normal blood glucose concentration including those found during pregnancy.

Contraindications:

- An abnormal fasting and/or postprandial hyperglycemia.
- Glucosuria with a positive acetone test without previous blood sugar determination.
- Clinical contraindications such as acute gastric and intestinal disturbances, fever or poor general and nutritional state.
- Pharmacological contraindications: hyper- or hypoglycemia including drugs such as corticosteroïds and antidiabetics.

Diet preparations. A sufficient carbohydrate supply (at least 150 grams) during three days before the test should be employed to enhance the accuracy of the test.

Time of examination. Optimal results will be obtained after a fasting period of 12 hours during the previous night. Results are negatively influenced by physical exertion such as walking long distances, bicycling or night work. A resting period of 30 minutes in a relaxed position appears essential.

Test beverage. 50 grams of dextrose solved in some 300 ml. of lukewarm water forms the beverage. Aromatized by some drops of lemon juice, it must be drunk within 5 minutes.

Position of the person examined during the test. The examination can best be carried out in the sitting position. For non ambulatory people best by sitting upright in bed.

Blood sampling. The European Study Group suggests the use of capillary blood for this test.

Time of blood sampling. Zero time fasting, 1 and 2 hours after the glucose consumption (European standard test).

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* *Summary of the 'Neue Schweizerische Richtlinien zur Diagnose des Diabetes Mellitus' (Teuscher, 1971).*

Modifications with less informative results. In a general practice it will also be possible to determine only the peak value between 30 and 90 minutes after 50 grams of glucose intake. In that case the same determination criteria are applied as those for the one hour value. It is also possible to effect a screening with only a two hour value. However, no definitive diagnosis may be made on the basis of this one value only as the variability is considerable particulary with the two hour value. A further simplification may be achieved by omission of the fasting glucose determination.

Examination of urine glucose: At least once at the end of the test.

Criteria. By the glucose oxidase method, expressed in mg/100 ml. the glucose values in capillary blood are:

	fasting	60 min.	120 min.
Normal level	< 100	< 160	< 210
Borderline levels	100 - 130	160 - 220	120 - 150
Pathological level	> 130	> 220	> 150

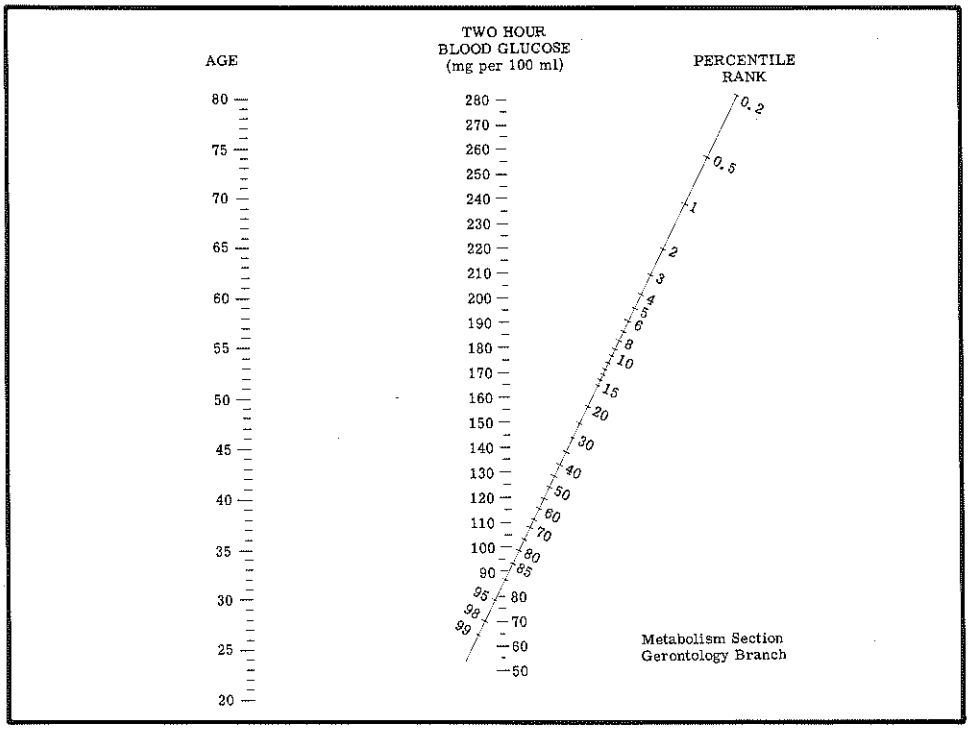
It should be noted that with 50 grams of glucose only a screening test is carried out since it is not possible to examine each person in hospital or general practice in a standardized way because of time limitations. Age, sex, body weight, medicine, body temperature, inactivity, pregnancy and other aspects that may affect the results have not been considered further. Intern this results in a relatively large borderline zone.

Furthermore with a positive test the decision "diabetes yes or no" must not be prejudiced when the blood sugar values are at a marginal level. Such a test indicates the possibility of diabetes and must be repeated. In practice a normal glucose tolerance mostly indicates "no diabetes at the time of the test," whereas a pathological glucose tolerance test does justify the diagnosis "diabetes mellitus" in most cases. When all three values are within normal limits, and yet glucosuria is present, the test must be judged as provisionally suspect since the blood sugar peak may have been missed. A subsequent repetition of the test will always be necessary dependent on its clinical urgency.

If under fasting conditions marked glucosuria is associated with three blood glucose values clearly within normal limits, there may just be renal glucosuria. In this case it must be recommended to perform a more extensive optimally standardized glucose tolerance test in order to be able to make a definite decision. (Teuscher, 1971).

ANNEX 6 *CHAPTER II*

ORAL GLUCOSE TOLERANCE TEST NOMOGRAM



The percentile rank compares the subject's performance to that of his own age cohorts. Thus, a rank of 50 % is an exactly average performance and a rank of 2 % is poor since it indicates that 98 % of subjects of the same age will perform better than the subject tested. This type of ranking is necessary because of the marked decrease in tolerance which accompanies aging and because of uncertainty as to standard for the diagnosis of diabetes. The table below is simply a rule of thumb for current use; it may be need to be adjusted in the future.

Age Group	Percentile Rank		
	Abnormal	Borderline	Normal
20-29	0-2	3-4	5 and over
30-39	0-3	4-6	7 and over
40-49	0-4	5-8	9 and over
50-59	0-5	6-10	11 and over
60-69	0-6	7-12	13 and over
70-plus	0-7	8-14	15 and over

(Andres, 1971)

ANNEX 7 *CHAPTER II*

SUMMARY OF THE EPIDEMIOLOGY STUDIES OF PHYSICAL ACTIVITY AND CORONARY ARTERY DISEASE

Study	Primary Investigator	Approximate Population Size (Middle-aged Men)	Period of Observation	Method of Assessing Physical Activity	Evaluation of Risk Factors	Diagnostic Criteria for CAD	Relationship of CAD to Physical inactivity and Comments
Retrospective Studies							
England-Wales mortality	Morris	2.000.000	1930-1932 1949-1952	Occupation on D.C.	No	CAD listed on D.C.	Positive but the diagnosis is based on death certificates physical activity on the title of last occupation and part of the data were obtained before the ECG was available for a diagnosis
Chicago mortality	Stamler	400.000	1951, 1953	Occupation on D.C.	No	CAD listed on D.C.	Negative but there is very little gradient in the activity level of the population
California mortality	Breslow	1.000.000	1949, 1951	Occupation on D.C.	No	CAD listed on D.C.	Positive but only after grouping the population according to general mortality
North Dakota	Zukel	20.000	1957	Occupation and questionnaire	Cigarette smoking only	Angina, coronary insufficiency AM CHF and sudden death due to CAD as reported in local medical records	Positive but the questionnaire evaluating physical activity was found to be inaccurate by the authors
London Transport	Morris	31.000	1949-1950	Drivers vs conductors	No (later done in follow up)	AMI, angina, death due to CAD as reported in industrial records	Drivers had a higher incidence of CAD but this could be due to the selection of other risk factors within this group, later studies showed them to be heavier, and to have higher BP and serum cholesterol
Israel kibbutzim	Brunner	6.000	1946-1961	Sedentary - 80 % or more of job time sitting: active - all others	No	AMI, angina, death due to CAD as reported in industrial records	Positive, but no other risk factors evaluated
U.S. railroad men	Taylor	100.000	1955-1956	Switchmen vs clerks and executives	No	CAD listed on D.C.	Positive, but influenced by differential rate of job transfers, those with CAD transfer most often from active to inactive jobs
South African railroad men	Adelstein	20.000	1954-1959	Job titles	No	CAD listed on D.C.	Negative
Washington D.C. postal employees	Kahn	1.500	1940-1962	Mail carriers vs clerks	No	CAD listed on D.C.	Positive
HIP	Frank	301	1961-1963	Questionnaire	No	Acute MI	Positive but the activity questionnaire is influenced by bias and selective forces favoring such a relationship
Toronto VA	Shanoff	100	1960	Questionnaire	Yes	Acute MI	Negative for "habitual" physival activity
Malmo Hospital	Forssman	66	1958	Occupation	Yes	Acute MI	Negative but physical activity determined only by occupational title
Prevalence Studies							
Peoples Gas Co. Chicago	Stamler	1.500	1958	Occupation	Yes	Diagnostic ECG, AMI sudden death, angina, coronary insufficiency and CHF due to CAD	Positive but affects of differential job transfers obvious those with CAD most often transfer from active to inactive jobs
U.S. railroad men	Taylor	2.000	1957-1959	Switchmen vs clerks and executives	Yes	Diagnostic ECG and angina	Positive but effects of differential job transfers obvious those with CAD most often transfer from active to inactive jobs
Evans County, Georgia	Mc Donough	1.000	1960	Occupation	Yes	Diagnostic ECG, angina and history of MI	Positive buth with similar biases as other prevalence studies
Prospective Studies							
San Francisco	Paffenbarger	3.300	1951-1967	Cargo workers vs clerks	Yes except cholesterol	CAD listed on D.C.	Positive but no cholesterols obtained and there is a selective process for men to become clerks or cargo workers
Framingham	Kannel	2.500	1949-1967	Questionnaire physiological measurements	Yes	CAD listed on D.C. diagnostic ECG changes symptomatic CAD	Positive but the physiologic parameters are of the uncertain relationship to physical activity
London transportation workers	Morris	687	1960-1965	Drivers vs conductors	Yes	AMI diagnostic ECG changes angina and sudden death	Positive but the drivers and the young recruits for bus driving had other risk factors for CAD

Study	Primary Investigator	Approximate Population Size (Middle-aged Men)	Period of Observation	Method of Assessing Physical Activity	Evaluation of Risk Factors	Diagnostic Criteria for CAD	Relationship of CAD to Physical inactivity and Comments
Gotesborg	Werko	834	1963-1967	Retrospective questionnaire	Yes	AMI diagnostic ECG changes and angina	Positive but the activity level was determined retrospectively
Western collaborative	Rosenman	3,180	1960-1965	Questionnaire	Yes	Diagnostic ECG changes angina AMI and death due to AMI	Positive main emphasis on personality types
Seven country	Keys	25,000	1960-1965	Questionnaire	Yes	Diagnostic ECG changes angina, AMI and death due to AMI	Negative, very heterogeneous because of different culture and peoples studied
Los Angeles	Chapman	1,400	1949-1962	Questionnaire	Yes	AMI, angina, sudden death coronary insufficiency	Negative but only job title used for activity level
U.S. railroad men	Taylor	2,000	1960-1965	Switchmen vs clerks and executives	Yes	AMI, angina, sudden death due to AMI and diagnostic ECG changes	Negative
Western Electric, Chicago	Paul	1,700	1957-1965	Job evaluation and title and interview	Yes	AMI, angina and death due to CAD	Negative
Peoples Gas Co. Chicago	Stamler	1,240	1958-1965	Job title	Yes	CAD listed on D.C.	Negative but inadequate physical activity gradient within the population
Rehabilitation Studies							
Cleveland rehabiltation group	Hellerstein	254	1960-1967	Physical training with parameters of Cv fitness measured	Yes; and appropriate treatment of risk factors	Death	Positive but volunteers and selection results in a healthier post infarction group
Israel rehabiltation group	Gottenheimer	1,103	1961-1966	Physical training with parameters of CV fitness measured	No	Death	Positive but volunteers and selection results in a healthier post infarction group
Pathological Studies							
National British Necropsy Series	Crawford and Morris	4,000	1954-1956	Last occupation	No	Macroscopic estimation	Negative, no difference in the degree of atherosclerosis of luminal obstruction among the activity levels, ischemic myocardial fibrosis appeared more common in inactive occupations
Israel Traumatic Death Autopsy Series	Mitrani	172	1968	Last occupation	No	Macroscopic estimation and calculation of luminal obstruction	Negative, no significant difference in atherosclerotic narrowing though there was slightly less in the active occupations
New York Medical Examiner Autopsy	Spain and Bradess	207	1957-1958	Last occupation	No	Macroscopic estimation	Negative, no difference in the degree of atherosclerosis between the activity levels
Oxford study	Rose	170	1962-1963	Last occupation	No	Degree of atherosclerosis not studied, macroscopic estimation of infarct size	Undiseased portion of RCA studied to judge size of coronary arterial tree; small RCA tended to be larger in active occupations though data only suggestive
Autopsy of Clarence DeMarr	Currens and P.D. White	1	1958	Lifelong history of marathon running	No	Macroscopic estimation	Coronary arteries 2-3 x normal diameter with mild atherosclerotic involvement but no luminal obstruction rather than secondary to running this could be genetically endowed and explain why he became a great runner

ANNEX 8 *CHAPTER II*

PREVALENCE OF DEFINITE AND BORDERLINE HYPERTENSION — UNITED STATES POPULATION BY AGE

White males		
Age group (years)	definite hypertension *	borderline hypertension **
18-79	12.8	17.7
18-24	1.7	11.6
25-34	3.6	11.7
35-44	11.8	14.9
45-54	16.5	17.3
55-64	20.2	28.4
65-74	25.0	26.6
75-79	30.3	27.1

* 160 mm Hg or over systolic, or 95 mm Hg or over diastolic

** Below 160 mm Hg systolic and below 95 mm Hg diastolic, but not simultaneously below 140 and 90 mm Hg.

(Lew, 1973)

VARIATIONS IN MORTALITY AMONG MEN ACCORDING TO SYSTOLIC AND DIASTOLIC PRESSURES. RATIOS OF ACTUAL TO EXPECTED MORTALITY — STANDARD MALE RISKS — 100%

Systolic Blood Pressure (mm Hg)	Diastolic Blood Pressure (mm Hg)	Mortality Ratio (%)*		
		Issue Ages		All Ages
		15-39 yr	40-69 yr	
128-137	< 83	111	108	109
	83-87	133	125	127
	88-92	157	134	140
	93-97	221	156	168
	98-102	(127)	213	197
138-147	< 83	130	142	141
	83-87	171	150	153
	88-92	213	166	170
	93-97	238	195	199
	98-102	288	215	224
148-157	< 88	186	179	180
	88-92	196	191	191
	93-97	258	221	224
	98-102	499	243	269
158-167	< 88	(167)	219	215
	88-92	(235)	240	240
	93-97	(441)	260	268
	98-102	(350)	286	289

* Where the number of policies terminated by death is 10 to 34, the mortality ratio is enclosed in parentheses.

(Lew, 1973)

ANNEX 10 *CHAPTER II*

PREVALENCE OF ELEVATED SERUM CHOLESTEROL IN THE GENERAL POPULATION OF THE UNITED STATES

Age Group (yr)	Prevalence (%)	
	260 mg or Higher	300 mg or Higher
Men		
18-74	17.7	4.7
18-24	3.9	0.6
25-34	10.3	1.9
35-44	20.1	7.0
45-54	25.7	5.3
55-64	23.4	6.9
65-74	21.6	6.1
Women		
18-74	22.7	8.2
18-24	4.4	1.7
25-34	7.4	1.4
35-44	12.7	2.8
45-54	27.9	6.2
55-64	49.6	20.8
65-74	51.0	26.7

NOTE: From National Center for Health Statistics, Public Health Service Publication No. 1000, Series 11, No. 22, Serum Cholesterol Levels of Adults, United States, 1960-62, Tables 1 and 2, March 1967.

(Lew, 1973)

ANNEX 11 *CHAPTER III*

REASONS FOR NOT PARTICIPATING IN SCREENING II

Participants screening I, who did not appear for screening II

Specified reasons for non-appearance

1. deceased between screening I and screening II

diagnosis:	malignity	5
	cardiovascular diseases	2
	accident	1
	unknown	1
total		9

2. patients with prolonged diseases

cardiovascular diseases and hypertension	3
chronic respiratory complaints	1
abnormalities of the tractus locomotorius	1
abnormalities of the tractus digestivus	3
accidents	4
other diagnosis	4
diagnosis unknown	1
total	17

3. moved/unreachable

moved	3
dismissed	3
prolonged stay abroad	1
total	7

4. refusers (statement of reasons)

not interested	6
not willing to give reasons	5
feels well and sees no reasons why	3
miscellaneous	8
total	22

THE MOTIVES OF INITIAL REFUSERS THAT YET PARTICIPATED IN SCREENING II AFTER PERSONAL CONTACT

actual back complaints when the invitation was received	2
fear of costs involved	3
complaints conserning screening I	4
no need for further examination in view of actual curative care	5
no need for examination in view of the fact that there are no complaints	6
miscellaneous	4
no invitation	1
total	25

ANNEX 12 *CHAPTER III*

PREPARATION FOR THE DETERMINATION OF THE FASTING BLOOD SUGAR

Occupational Health Service for the Port of Rotterdam
St. Jobsweg 7
Rotterdam-3006
Telephone 010-76 36 44

Rotterdam,

Dear Sir,

We expect you .....day ..... at 8.30 a.m. at the Occupational Health Service for the Port of Rotterdam, St. Jobsweg 7, Rotterdam for a bloodtest.
In order to achieve maximum results of the test it will be essential that you adhere strictly to the following instructions.

Please do not drink beer or coca cola on .....day ....., further you may consume any food or beverage until 10.00 p.m.
After 10.00 p.m. absolutely no food or drink, apart from one glass of water getting up in the morning.
Immediately after the blood has been sampled restrictions for food and drink will end.

Yours sincerely,

ANNEX 13 *CHAPTER III*

QUESTIONNAIRE PERIODICAL MEDICAL EXAMINATION "COPIH"

Punchcard number
O. H. S.
Examination number
Date

A

1. What is your profession or function ?
2. How long have you been working for your present employer ? ☐☐ years
3. How long have you been working in this function ? ☐☐ years
4. If married, how old is your wife ? ☐☐ years
5. How many children do you have ? ☐☐
6. Who is your physician ?
   Name :
   Address :

B

	yes	no
1. Have you ever had any pain or discomfort in your chest ? (do not include complaints on account of a cold).	☐	☐
2. Have you ever had any pressure or heaviness in your chest ? (not including complaints on account of a cold).	☐	☐
3. Have you ever had ATTACKS of pain in the lower jaw, throat, shoulders or fingers ?	☐	☐

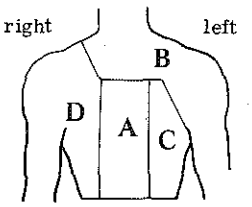
If "no" to question 1, 2 and 3 proceed to question 12.
If "yes" to question 1, 2 or 3 answer next questions:

4. Do you get it when you walk uphill or up a stairs, or hurry or walk against the wind ?	☐	☐
5. Do you get it while you are walking at a normal speed on level country ?	☐	☐

6. What do you do if you get it while you are walking ?
   - carry on ☐
   - stop or slow down ☐
   - place a tablet under the tongue ☐

7. If you stand still, will the pressure disappear
   - in a short time (10 minutes) ☐
   - after more than 10 minutes ☐
   - not at all ☐

8. Will you mark where this pain or pressure was generally located ?



yes no

9. Do you have complaints within 10 minutes after a meal ? ☐ ☐
10. Do you often have complaints when you are excited or upset ? ☐ ☐
11. Do you have complaints when you come from a warm into a cold surroundings ? ☐ ☐
12. Have you ever had a severe pain across the front of your chest lasting for half an hour or more ? ☐ ☐

If "no" proceed to question 15. If "yes" answer the following questions.

13. How many of these attacks have you had ? ☐ ☐
14. How long ago did you have your last attack ?
    - less than 1 year ☐
    - 1-3 years ago ☐
    - over 3 years ago ☐

15a. Have you ever been checked for pain in the chest by an internist or a cardiologist ? ☐ ☐

If yes, by whom ?
In which year ?

b. As far as you know have any irregularities been found during this examination ? ☐ ☐

16. Have any anticoagulant been prescribed to you ? (Sintrom or Marcoumar)
17. Are you regularly checked in account of these complaints by a specialist or thrombosis service ? ☐ ☐
18. When has been your last visit there ? ☐ ☐

C

1. Do you get pain in either leg on walking ? ☐ ☐

If "no" proceed to D, if "yes" answer the following questions.

2. Does this pain issues from the back ? ☐ ☐
When this pain issues from the back proceed to D.
3. Does this pain begin when you are standing still or sitting ? ☐ ☐
4. In what part of your leg do you feel it ?
    - in the calf ☐
    - someplace else ☐
5. Do you get it when you walk uphill or hurry ? ☐ ☐
6. Do you get pain or discomfort when walking at normal speed on level country ? ☐ ☐

If "no" to these questions proceed to D, if "yes" to one of the questions answer the following questions.

7. Does the pain ever disappear while you are walking ? ☐ ☐
8. What do you do if you get it while you are walking ?
    - stop or slow down ☐
    - carry on ☐
9. When you stop, does the pain disappear
    - within short time (10 minutes) ☐
    - after more than 10 minutes ☐
    - not at all ☐
10. Have you ever been examined for pain in one of the legs when you walk by a cardiologist or internist ? ☐ ☐

If so, by whom ?
When has this been ?

D

	yes	no
1. Do you get swollen ankles or feet in the evening ?	☐	☐
2. Do you sleep with more than one pillow ?	☐	☐
3. Do you usually have to leave your bed more than once per night to urinate ?	☐	☐

E

1. Have you ever had raised blood pressure ?	☐	☐
If "no" proceed to F, if "yes" answer the following questions		
2. Are you following a diet for that reason ?	☐	☐
3. Are you using medicine for that ?	☐	☐

F

1. Have you ever smoked ? ☐ ☐

If "no" proceed to G, if "yes" fill in the following table .

2. How much do/did you smoke :	now
cigarettes (per day)	
hand-rolled (packets per week)	
cigars (per week)	
small cigars (per week)	
pipe tobacco (packets per week)	
	1 year ago
cigarettes (per day)	
hand-rolled (packets per week)	
cigars (per week)	
small cigars (per week)	
pipe tobacco (packets per week)	
	3 or more years ago
cigarettes (per day)	
hand-rolled (packets per week)	
cigars (per week)	
small cigars (per week)	
pipe tobacco (packets per week)	

3. If you have decreased or stopped smoking, did you do so on account of chest complaints ? ☐ ☐

G

1. Do you work mainly	sitting down ?	☐
	standing ?	☐
	walking ?	☐
	bending forward, kneeling, bending ?	☐

		yes	no
2. Have your previous functions been	physically more strenuous ?	☐	
	as strenuous ?	☐	
	less strenuous ?	☐	
	question inapplicable ?	☐	
3. How do you go to your work ?	walking	☐	
	by bycicle	☐	
	by moped or motorbike	☐	
	by car	☐	
	by tram, bus, train	☐	
	by commute bus (company transport)	☐	
4. Do you have, apart from your work, several times a week indoor or outdoor activities such as carpentry, paperhanging, paint jobs, gardening, domestic activities ?		☐	☐
5. Are you active in sport or regular physical training ?		☐	☐
6. If so, how many hours per week ?		☐☐	
7. Does your work regularly include short periods of extra heavy physical effort, such as			
climbing stairs and ladders ?		☐	
lifting or carrying heavy loads ?		☐	
strenuous pushing or pulling ?		☐	

H

1. Are you a diabetes patient ?		☐	☐
If "no" proceed to I, if "yes" answer the following questions.			
2. How many years have you suffered from this disease ?		☐☐	
3. Do you have a diet for this reason ?		☐	☐
4. Do you use medicine for this reason ?		☐	☐

I

1. How many elder brothers do you have (have you had) ?		☐☐	
2. How many elder sisters do you have (have you had) ?		☐☐	
3. How many younger brothers do you have (have you had) ?		☐☐	
4. How many younger sisters do you have (have you had) ?		☐☐	
Has (or had) anyone in your family (father, mother, brothers or sisters) one or more of the following diseases ?			
		before 55	after 55
5. Father	heart failure	☐	☐
	stroke	☐	☐
	hypertension	☐	☐
	diabetes	☐	☐
6. Mother	heart failure	☐	☐
	stroke	☐	☐
	hypertension	☐	☐
	diabetes	☐	☐
7a. Brothers	heart failure	☐	☐
	stroke	☐	☐
	hypertension	☐	☐
	diabetes	☐	☐

			before 55	after 55
7b.	How many brothers are concerned ?		☐	☐
8a.	Sisters	heart failure	☐	☐
		stroke	☐	☐
		hypertension	☐	☐
		diabetes	☐	☐
8b.	How many sisters are concerned ?		☐	☐

9. Are in your family (parents, brothers, sisters) any cases of sudden death before the age of 55 from other causes than by accident ?

Cross what is applicable

- father ☐
- mother ☐
- number of brothers ☐
- number of sisters ☐

J

	yes	no
1. Generally speaking, does your job run smoothly ?	☐	☐
2. Would you actually take things a bit more easy ?	☐	☐
3. Do you generally feel in the mood to pay visits, to do things with your hand, to play cards, to read or to study after the day's work is done ?	☐	☐
4. Have you felt insecure or irresolute lately ?	☐	☐
5. Do you regularly have tense or irritated moods or do you worry a lot ?	☐	☐
6. Do you have complaints about headaches, dizzy spells or stomach trouble ?	☐	☐
7. Have you slept badly lately ?	☐	☐
8. When you wake up in the morning do you usually feel fit for the chores of the coming day ?	☐	☐
9. Generally speaking, do you feel comfortable and well off ?	☐	☐
10. Are you making a joke now and then ?	☐	☐
11. Are you often singing or whistling ?	☐	☐

K

1. Do you do your work with pleasure ?	generally speaking, yes	☐
	varying	☐
	mostly not	☐
2. Would you like to have a higher function then you have now ?		☐ ☐
3. Do you often work overtime hours or do you often take work home ?		☐ ☐
4. Does your house satisfy you ?		☐ ☐
5. How many children are still living in your house ?		☐☐
6. Are there any problems in your family or close vicinity that mean extra burden to you ?		☐ ☐
7. Generally speaking how long does it take you to go from your home to your job (only out) ?		
	less than 20 minutes	☐
	20 minutes to one hour	☐
	1 to 2 hours	☐
	longer than two hours	☐
8. Do you think the trip from and to your work unpleasant ?		☐ ☐
9. How many hours are you away from home on a working day ? (round off on half hours)		☐☐☐

	yes	no
10. Do you work:		
in shifts (varying duties)	☐	☐
exclusively day duty or night duty ?	☐	☐

L

1. Are you very short of breath when hurrying on level country or slightly uphill ?	☐	☐
2. Are you very shortwinded when you are walking with other people on level country at a normal speed ?	☐	☐
3. Do you have to stop to catch your breath when you walk on level country at your own speed ?	☐	☐
4. Are you short of breath when you are washing or dressing ?	☐	☐

M

1. Do you usually cough first thing in the morning (when getting up) ? (count a cough with first smoke or on "first going out of doors". Exclude clearing throat or a single cough).	☐	☐
2. Do you usually cough during the day or at night ? (ignore an occasional cough)	☐	☐
If "no" proceed to N, if "yes" to one of the two questions, answer the following questions		
3. Do you cough like this on most days for as much as 3 months each year ?	☐	☐
4. Do you usually bring up any phlegm from your chest first thing in the morning (when getting up) ? (count bringing up phlegm with first smoke or on first going out of doors. Exclude phlegm from nose. Include swallowed phlegm).	☐	☐
5. Do you usually bring up any phlegm from your chest during the day or at night ?	☐	☐
6. Do you bring up any phlegm most days, as indicated, from your chest during at least three months per year ?	☐	☐

N

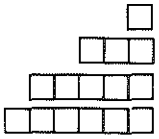
1. Have you ever gone through a period with daily complaints of pain in the stomach, stomach acid, eructations ?	☐	☐
2. Were these complaints related to eating ?	☐	☐
3. Have you ever had gallstone trouble ?	☐	☐

O

1. Have you had any complaints about your health which you did not see when reading this questionnaire ?	☐	☐
2. If so, which are these complaints ?		
3. Do you feel the need of consulting your occupational health officer ?	☐	☐

COPIH VRAGENLIJST

Ponskaartnummer
B. G. D.
Onderzoeknummer
Datum



A

1. Wat is uw beroep of funktie ?
2. Hoe lang werkt u bij uw huidige werkgever ? ☐☐ jaar
3. Hoe lang werkt u in deze funktie ? ☐☐ jaar
4. Indien gehuwd, hoe oud is uw echtgenote ? ☐☐ jaar
5. Hoeveel kinderen hebt u ? ☐☐
6. Wie is uw huisarts ?
   Naam
   Adres

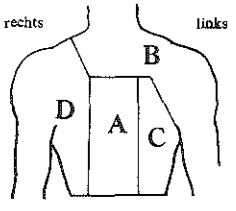
B

	ja	nee
1. Hebt u wel eens pijn of een onaangenaam gevoel in de borst gehad ? (klachten bij verkoudheid niet meerekenen)	☐	☐
2. Hebt u wel eens een drukkend of zwaar gevoel in de borst gehad ? (klachten bij verkoudheid niet meerekenen).	☐	☐
3. Hebt u wel eens aanvallen van pijn in de onderkaak, keel, schouders of vingers ?	☐	☐

Indien "neen" op vraag 1, 2 en 3, ga dan verder naar vraag 12,
Indien "ja" op vraag 1, 2 of 3, beantwoord dan de volgende vragen:

4. Krijgt u last als u een helling of trap oploopt, zich voorthaast of tegen de wind in loopt ?	☐	☐
5. Krijgt u last indien u in gewoon tempo op vlak terrein loopt ?	☐	☐

6. Wat doet u als u last krijgt terwijl u loopt ?
   - gewoon doorlopen ☐
   - langzamer lopen of stilstaan ☐
   - een tablet onder de tong nemen ☐
7. Indien U stilstaat, verdwijnt de last dan
   - binnen korte tijd (10 minuten) ? ☐
   - na meer dan 10 minuten ? ☐
   - helemaal niet ? ☐
8. Wilt u aangeven waar deze pijn of dit drukkend gevoel meestal zat ?



ja neen

9. Krijgt u last binnen 10 minuten na een maaltijd ? ☐ ☐
10. Krijgt u vaak last wanneer u opgewonden of overstuur bent ? ☐ ☐
11. Krijgt u last als u van de warmte in de kou komt ? ☐ ☐
12. Hebt u ooit een ernstige pijn in of op het voorste gedeelte van uw borst gehad, die een half uur of langer duurde ? ☐ ☐

Indien "neen" op vraag 12, ga dan verder naar vraag 15. Indien "ja" beantwoord dan de volgende vragen.

13. Hebt u meer dan eens zo'n aanval gehad ? ☐ ☐
14. Hoe lang geleden had u de laatste aanval ?

minder dan 1 jaar ☐
1 - 3 jaar geleden ☐
meer dan 3 jaar geleden ☐

15a. Bent u wel eens voor pijn in de borst door een internist of hartspecialist onderzocht ? ☐ ☐

Zo ja door wie ?
In welk jaar ?

b. Zijn er bij dit onderzoek naar u weet afwijkingen gevonden ? ☐ ☐
16. Krijgt u "bloedverdunnende" middelen" (Sintrom of Marcoumar) ☐ ☐
17. Staat u voor deze klachten onder geregelde controle van een specialist of thrombose-dienst ? ☐ ☐
18. Wanneer bent u daar voor het laatst geweest ?

C

1. Hebt u wel eens pijn in één van de benen gedurende het lopen ? ☐ ☐

Indien "neen" ga dan verder naar D, indien "ja" beantwoord dan de volgende vragen,

2. Komt deze pijn uit de rug ? ☐ ☐
Indien deze pijn uit de rug komt ga dan verder naar D
3. Begint deze pijn wanneer u stilstaat of zit ? ☐ ☐
4. In welk gedeelte van de benen voelt u de pijn ?

in de kuit ☐
ergens anders ☐

5. Krijgt u deze pijn wanneer u een helling oploopt, zich voorthaast ? ☐ ☐
6. Krijgt u pijn of last indien u in gewoon tempo op vlak terrein loopt ? ☐ ☐

Indien "neen" op deze vragen ga dan naar D, indien "ja" op één van de vragen beantwoord dan de volgende vragen.

7. Verdwijnt de pijn ooit terwijl u loopt ? ☐ ☐
8. Wat doet u indien u last krijgt terwijl u loopt ?

stilstaan of langzamer lopen ☐
doorlopen ☐

9. Wanneer u stilstaat, verdwijnt de pijn dan

binnen korte tijd (10 minuten) ? ☐
na meer dan 10 minuten ? ☐
helemaal niet ? ☐

10. Bent u wel eens voor pijn in één van de benen bij het lopen door een hartspecialist of internist onderzocht ? ☐ ☐

Zo ja, door wie ?

Wanneer is dit geweest ?

D

	ja	neen
1. Hebt u 's avonds dikke enkels of voeten ?	☐	☐
2. Slaapt u met meer dan één kussen ?	☐	☐
3. Moet u gewoonlijk meer dan eens per nacht uw bed uit om te urineren ?	☐	☐

E

1. Is bij u ooit een verhoogde bloeddruk gevonden ?	☐	☐
Indien "neen" ga dan verder naar F, indien "ja" beantwoord dan de volgende vragen.		
2. Houdt u hiervoor dieet ?	☐	☐
3. Gebruikt u hiervoor geneesmiddelen ?	☐	☐

F

1. Hebt u ooit gerookt ?	☐	☐

Indien "neen" ga dan verder naar G, indien "ja" vul dan onderstaande tabel in.

2. Hoeveel rookt(e) u	nu
sigaretten (per dag)	
shag (pakjes per week)	
sigaren (per week)	
kleine sigaartjes (per week)	
pijptabak (pakjes per week)	
	1 jaar geleden
sigaretten (per dag)	
shag (pakjes per week)	
sigaren (per week)	
kleine sigaartjes (per week)	
pijptabak (pakjes per week)	
	3 jaar of langer geleden
sigaretten (per dag)	
shag (pakjes per week)	
sigaren (per week)	
kleine sigaartjes (per week)	
pijptabak (pakjes per week)	

3. Indien u het roken verminderd of gestaakt hebt, is dat dan gebeurd wegens borstklachten ?	☐	☐

G

1. Werkt u voornamelijk	zittend ?	☐
	staand ?	☐
	lopend ?	☐
	voorovergebogen, knielend, bukkend ?	☐

N. B. Alle van toepassing zijnde hokjes aankruisen, eventueel meer dan 1).

		ja	neen
2. Waren uw vorige funkties	lichamelijk zwaarder ?	☐	
	even zwaar ?	☐	
	lichter ?	☐	
	vraag niet van toepassing ?	☐	
3. Hoe gaat u naar uw werk ?	lopend	☐	
	per fiets	☐	
	per brommer of motorfiets	☐	
	per auto	☐	
	per tram, bus, trein	☐	
	per pendelbus (bedrijfsvervoer)	☐	
4. Hebt u naast uw werk nog meermalen per week bezigheden thuis of buitenshuis, zoals timmeren, behangen, schilderen, tuinwerk, huishoudelijke werkzaamheden ?		☐	☐
5. Doet u aan sport of traint u regelmatig ?		☐	☐
6. Indien ja, hoeveel uren per week ?		☐☐	
7. Komen bij uw werkzaamheden regelmatig kortdurende perioden van extra zware lichamelijk inspanning voor, zoals b.v.			
	trappen of ladders beklimmen ?	☐	
	tillen of dragen van lasten ?	☐	
	zwaar trekken of duwen ?	☐	

H

1. Bent u lijdende aan suikerziekte ?		☐	☐
Indien "neen" ga dan verder naar I, indien "ja" beantwoord dan de volgende vragen.			
2. Hoeveel jaren lijdt u hieraan ?		☐☐	
3. Houdt u hiervoor dieet ?		☐	☐
4. Gebruikt u hiervoor geneesmiddelen ?		☐	☐

I

1. Hoeveel oudere broers hebt u (gehad) ?		☐☐	
2. Hoeveel oudere zusters hebt u (gehad) ?		☐☐	
3. Hoeveel jongere broers hebt u (gehad) ?		☐☐	
4. Hoeveel jongere zusters hebt u (gehad) ?		☐☐	
Is iemand van uw naaste familie (vader, moeder, broers of zusters) lijdende (geweest) aan één of meer van de hier genoemde ziekten ?		vóór het 55e jaar	na het 55e jaar
5. Vader	hartinfarct	☐	☐
	beroerte	☐	☐
	hoge bloeddruk	☐	☐
	suikerziekte	☐	☐
6. Moeder	hartinfarct	☐	☐
	beroerte	☐	☐
	hoge bloeddruk	☐	☐
	suikerziekte	☐	☐
7a. Broers	hartinfarct	☐	☐
	beroerte	☐	☐
	hoge bloeddruk	☐	☐
	suikerziekte	☐	☐

		vóór het 55e jaar	na het 55e jaar
7b. Hoeveel broers betreft dit ?		☐	☐
8a. Zusters	hartinfarct	☐	☐
	beroerte	☐	☐
	hoge bloeddruk	☐	☐
	suikerziekte	☐	☐
8b. Hoeveel zusters betreft dit ?		☐	☐

9. Zijn er in uw naaste familie (ouders, broers en zusters) gevallen bekend van plotselinge dood voor het 55e jaar anders dan door ongeval ? Aankruisen wat van toepassing is

vader	☐
moeder	☐
aantal broers	☐
aantal zusters	☐

J

	ja	neen
1. Gaat het werk u in het algemeen gemakkelijk af ?	☐	☐
2. Zoudt u eigenlijk alles wat kalmer aan willen doen ?	☐	☐
3. Heeft u doorgaans na afloop van het werk nog zin om op visite te gaan te knutselen, te kaarten, te lezen of te studeren ?	☐	☐
4. Voelt u zich de laatste tijd onzeker of besluiteloos ?	☐	☐
5. Voelt u zich regelmatig gespannen en prikkelbaar of piekert u veel ?	☐	☐
6. Heeft u wel eens last van hoofdpijn, duizelingen of maagklachten ?	☐	☐
7. Slaapt u de laatste tijd slecht ?	☐	☐
8. Als u 's morgens wakker wordt, voelt u zich dan doorgaans opgewassen tegen de komende dag ?	☐	☐
9. Hebt u het over 't algemeen naar uw zin ?	☐	☐
10. Maakt u nog wel eens een grapje ?	☐	☐
11. Loopt u vaak te zingen of te fluiten ?	☐	☐

K

1. Doet u uw werk met plezier ?	meestal wel	☐
	wisselend	☐
	meestal niet	☐
2. Zoudt u graag een hogere funktie willen hebben dan u nu hebt ?		☐ ☐
3. Verricht u vaak overwerk of neemt u vaak werk mee naar huis ?		☐ ☐
4. Woont u naar uw zin ?		☐ ☐
5. Hoeveel kinderen wonen bij u thuis ?		☐☐
6. Zijn er problemen in uw gezin of naaste omgeving, die u extra zorg geven ?		☐ ☐
7. Hoe lang bent u gemiddeld onderweg van huis naar werk ? (alleen heenweg)		
	korter dan 20 minuten	☐
	20 minuten tot 1 uur	☐
	1 tot 2 uur	☐
	langer dan 2 uur	☐
8. Vindt u het reizen naar en van uw werk onaangenaam ?		☐ ☐
9. Hoeveel uren bent u op een werkdag van huis ? (afronden op halve uren)		☐☐☐

	ja	neen
10. Werkt u:		
in ploegendienst (wisselende diensten)	☐	☐
uitsluitend dagdienst of nachtdienst ?	☐	☐

L

1. Wordt u erg kortademig wanneer u zich voorthaast op vlak terrein of tegen een lichte helling oploopt ?	☐	☐
2. Wordt u erg kortademig terwijl u met anderen in normaal tempo op vlak terrein loopt ?	☐	☐
3. Moet u stil gaan staan om op adem te komen, wanneer u in uw eigen tempo op vlak terrein loopt ?	☐	☐
4. Bent u kortademig bij het wassen of aankleden ?	☐	☐

M

1. Hoest u 's morgens gewoonlijk meteen al (bij het opstaan) ? (hoesten bij het eerste roken of bij het "eerste naar buiten gaan" meetellen. Keel schrapen of een enkele kuch niet meerekenen).	☐	☐
2. Hoest u gewoonlijk in de loop van de dag of 's nachts ? (af en toe hoesten verwaarlozen).	☐	☐
Indien "neen" ga dan verder naar N, indien "ja" op één van de twee vragen, beantwoord dan de volgende vragen:		
3. Hoest u, zoals juist aangegeven, de meeste dagen gedurende tenminste drie maanden per jaar ?	☐	☐
4. Geeft u 's morgens gewoonlijk meteen al (bij het opstaan) enig slijm op uit de luchtwegen? (Slijm opgeven bij het eerste roken of bij het eerste naar buiten gaan meetellen. Slijm uit de neus niet meetellen. Wel ingeslikt slijm meetellen).	☐	☐
5. Geeft u overdag of 's nachts enig slijm op uit de luchtwegen ?	☐	☐
6. Geeft u, zoals juist aangegeven, de meeste dagen enig slijm op uit de luchtwegen gedurende ten minste drie maanden per jaar?	☐	☐

N

1. Hebt u wel eens een periode doorgemaakt, waarin u dagelijks last had van maagpijn, zuurbranden, oprispingen ?	☐	☐
2. Hingen deze klachten samen met eten ?	☐	☐
3. Hebt u ooit last van galstenen (gehad) ?	☐	☐

O

1. Hebt u klachten over uw gezondheid, die u bij het doorlezen van deze vragenlijst niet bent tegengekomen ?	☐	☐
2. Zo ja, waaruit bestaan dan deze klachten ?		
3. Heeft u behoefte aan een gesprek met de bedrijfsarts ?	☐	☐

ANNEX 14 *CHAPTER III*

REASONS WHY NO EXERCISE TEST HAS BEEN PERFORMED

serious resting ECG abnormalities whether or not in combination with angina pectoris	9
peripheral vascular disease	4
orthopedic abnormalities	2
refusal	2
total	18

INDICATIONS FOR THE INTERRUPTION OF THE EXERCISE TEST

Generally speaking the exercise was terminated **WHEN A MINUTE HAD PASSED** after any of the following took place:

- the heart frequency had passed 170 beats/min.;
- the ventricular frequency during atrial fibrillation had risen to 150 beats/min. or over;
- the systolic blood pressure had increased to 280 mm Hg or over;
- the diastolic blood pressure compared to the starting value at rest had increased to 20 mm Hg or over (measured several times);
- the diastolic blood pressure had increased to 140 mm Hg or over;
- the product of systolic blood pressure and cardiac frequency had exceeded 35.000;
- the respiratory frequency had increased to 35/min. or more;
- ventricular extrasystoles quadripled or when bigemini, trigemini occurred;
- the QRS complex had gradually widened to over 0.12 seconds;
- ST-J depressions compared to the starting picture were observed in excess of 1½ millimetres or more with a horizontal or declining ST-segment;
- a complete T-top inversion took place;
- the person gave the clinical impression of being close to his maximum stress level;
- the person examined became markedly pale or showed signs of cyanosis;
- the person examined became clearly dyspneic;
- the person examined indicated that he was practically exhausted;
- there were complaints of pain in the legs;
- The rate of revolutions of the pedals decreased to 45/min. or less, while the examinee was urged to continue.

The exercise has **IMMEDIATELY** been stopped by the physician (regardless of time) when:

- more than one ventricular extrasystole in succession was observed on the scope (bouts of bref ventricular tachycardia);
- when ventricular extrasystoles were observed near the T-waves of the preceding sinus beats (R on T phenomenon);
- a paroxysm of supraventricular tachycardia occurred with a frequency that exceeded the standard for the level of exertion performed;
- paroxysmal atrial fibrillation occurred;
- a **sudden** widening of the QRS-complex to more than 0.12 seconds manifested itself (complete bundlebranch block) took place;

— a second or third degree atrioventricular block arose;

— the person examined reported angina pectoris;

— the person examined complained of dizziness or lightheaded feeling;

— a blood pressure fall was registrated of 30 mm Hg or more systolically compared with the previous measurement (measured several times);

— the clinical condition of the person examined necessitated so for other reasons.

ANNEX 16 *CHAPTER III*

CODING CRITERIA OF THE EXERCISE ECG

I. *Description.*

- no disturbances.
- supraventricular- or ventricular extrasystoles not influenced by the exercise test.
- intraventricular conduction disturbances not influenced by the exercise test.
- pathologic QRS-complex not influenced by the exercise test.
- atrioventricular conduction disturbances not influenced by the exercise test.
- ST-J-depression with an ascending ST-segment.
- excessive supraventricular tachycardia.
- supraventricular- or ventricular extrasystoles clearly increasing during exercise.
- atrioventricular- or intraventricular conduction disturbances clearly increasing during exercise.
- ST-segment disturbances with an initial horizontal or descending ST-segment.
- T-top inversion.
- ventricular tachycardia.

II. *Interpretation*

- No disturbances.
- possible ischemia cordis.
- probable ischemia cordis.
- other disturbances.

ANNEX 17 *CHAPTER III*

MODEL OF THE LETTER WITH CASE INFORMATION TO THE GENERAL PRACTITIONER

OCCUPATIONAL HEALTH SERVICE
FOR THE PORT OF ROTTERDAM

Occupational Health Service
St. Jobsweg 7
Rotterdam3006
Telephone 010-76 36 44

Rotterdam,

Dear colleague,

We were visited by your patient

mr.
born: address:
at: function:

for a regular medical examination on.....

Previous periodical medical examination has (not) been effected (on.....)

History:

Height:		cm
Weight:		kg.
Blood pressure in recumbent position:		mmHg
Varices:		yes/no
Ankle/foot oedema:		yes/no
Tractus Locomotorius:		

Blood:	Hb	mmol/l =	%	Cholesterol:	g/l	=	mg%
	BSR	mm first hour		Total lipids:	g/l	=	mg%
Urine:	Albumen:	negative/positive		Bloodsugar:	mmol/l	=	mg%
	Glucose:	negative/positive					
	Urine sedimentation:						

Lungfunction:	P.E.F.	=	l/min.
	F.E.V. 1 sec.	=	cl.
	F.E.V. 5 sec.	=	cl.
	V.C. exp.	=	cl.
	F.E.V. 1/F.E.V. 5	=	%

E.C.G.:

Odelca: No/the following abnormalities of heart and lungs.

Exercisetest on the bicycle ergometer:

The stress proceeded according to a stepwise schedule.
The initial load is 3 minutes of 15 Watt, followed by 3 minutes of 45 and 75 Watt. The next 3 steps at loads of 105 Watt, 135 Watt and 165 Watt have to be maintained for 5 minutes each.
The above mentioned schedule has/has not been fully completed.
The program was stopped in the ..... minute of the ..... Watt phase on account of .....

The course of cardiac frequency, blood pressure and respiratory frequency has been represented in the following schedule:

Stress	Cardiac frequency beats/min	Blood pressure mm Hg	Respiratory frequency R/min

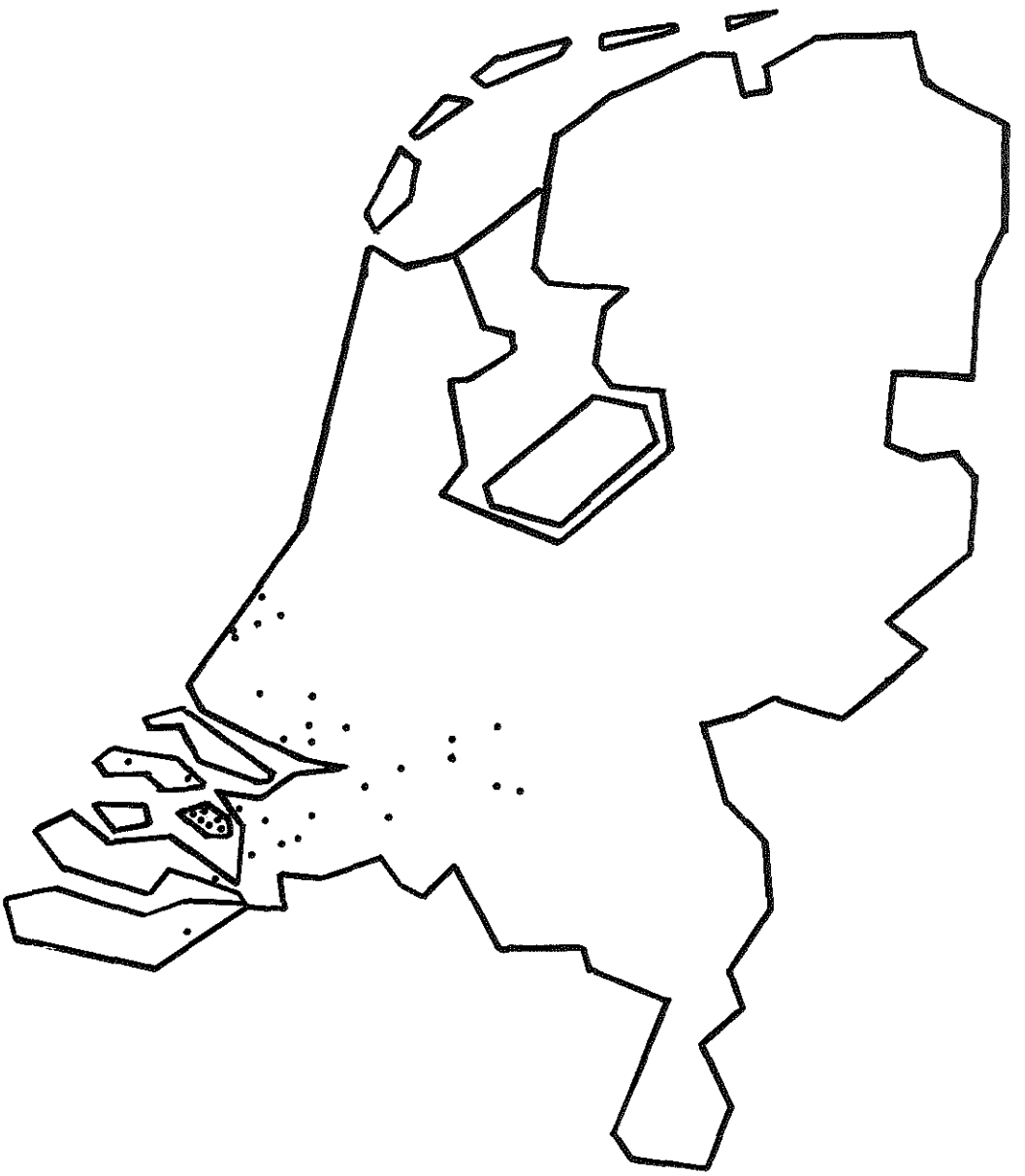
E.C.G. during stress and recovery phases: (the bipolar thorax leads CM 4 and CM 6 have been registered)
Summary:

Advice capacity for work:

Sincere fraternal regards,

ANNEX 18 *CHAPTER IV*

REGIONAL DISTRIBUTION OF THE GENERAL PRACTITIONERS VISITED



ANNEX 19 *CHAPTER IV*

MODEL OF INTRODUCTORY LETTER TO THE GENERAL PRACTITIONERS IN PREPARATION OF THE INTERVIEW

OCCUPATIONAL HEALTH SERVICE
FOR THE PORT OF ROTTERDAM

Occupational Health Service
St. Jobsweg 7
Rotterdam-3006
Telephone 010-76 36 44

Dear colleque,

In 1971 the Occupational Health Service for the Port of Rotterdam has started a study concerning the cardio-respiratory condition of dockworkers in the age of 55 to 65 years (thesis Baart). The results of each individual examination have been sent by letter to the general practitioner of the person examined. In 1972/1973 I have repeated this study examining the same people with the same standards.

When pathology was found, both in the first and the second examinations the person examined has been advised to go to his own doctor.

In order to obtain some information about the results of these directions, I have the intention to visit the doctors of the participants involved in order to collect this information in a standardized way with the aid of a questionnaire. I will report these results and the follow-up information in the form of a thesis.

I hope you will allow me to contact you one of these days by telephone to ask your co-operation in this research and, if necessary, to give additional explanation.

I sincerely hope you will be willing to co-operate, and remain,

with fraternal regards,

A. Schelling, M.D.

QUESTIONNAIRE VISIT GENERAL PRACTITIONER

Translation

patient number : ☐☐☐
date inquiry : ☐☐☐☐☐☐
name patient : _____
address : _____
residence : _____

function before screening I : _____ ☐
function after screening I : _____ ☐
function after screening II : _____ ☐

present doctor (screening II) nr. : ☐☐☐
name : _____
address : _____
residence : _____

poss. previous doctor (screening I) nr. : ☐☐☐
name : _____
address : _____
residence : _____

date letter I : ☐☐☐☐☐☐
date letter II : ☐☐☐☐☐☐

final minute exercise test I : ☐ minute of the ☐☐☐ Watt phase
final minute exercise test II : ☐ minute of the ☐☐☐ Watt phase

RISK PROFILE	I	II
smoking	pos. ☐ neg. ☐	pos. ☐ neg. ☐
blood pressure	☐☐☐ mm Hg ☐☐☐	☐☐☐ mm Hg ☐☐☐
cholesterol	☐☐☐ mg %	☐☐☐ mg %
total lipids	☐☐☐ mg %	☐☐☐ mg %
weight	☐☐☐ kg.	☐☐☐ kg.
G. T. T.	☐☐ ☐☐ ☐☐	☐☐ ☐☐ ☐☐
ECG - ischemia	pos. ☐ neg. ☐	pos. ☐ neg. ☐
- rhythm/cond. disturb.	pos. ☐ neg. ☐	pos. ☐ neg. ☐
- other disturbances	pos. ☐ neg. ☐	pos. ☐ neg. ☐

SCREENING I

blood pressure	:	below standard	0
		over standard	1
cholesterol	:	below standard	0
		over standard	1
G. T. T.	:	below standard	0
		over standard	1
		inapplicable	2

SCREENING II

blood pressure	:	below standard	0
		over standard	1
cholesterol	:	below standard	0
		over standard	1
G. T. T.	:	below standard	0
		over standard	1
		inapplicable	2

PART I

1. Did you receive letter II of date [ ][ ][ ][ ][ ][ ] ?
   - impossible to check 0
   - yes: straight from O. H. S. 1
   - yes: from addressee 2
   - no 3

2. Did you receive letter I of date [ ][ ][ ][ ][ ][ ] ?
   - impossible to check 0
   - yes: straight from O. H. S. 1
   - yes: from addressee 2
   - no 3

3. How long has patient belonged to your practice ?
   - < 6 months 1
   - 6-12 months 2
   - ⩾12 months 3

4. Does your patient come under the National Health system? (sick found)
   Explication : people with incomes just over the National Health system will sometimes not be insured for the fees of general practitioners so that they will possibly sooner be directed to specialists in order to avoid putting them to expenses.
   - impossible to check 0
   - yes 1
   - no 2

5. Has patient followed our advice to consult you for the disturbances we have found ?
   - impossible to check 0
   - yes 1
   - no 2

6. When you have received letter I:
   Has the information we have supplied you concerning pathology and risk factors, been a reason for you to take the initiative on behalf of your patient (e.g. to visit him, to send him a notice to come to your consulting hour etc.) ?
   - impossible to check 0
   - yes 1
   - no 2

Continue with questionnaire part I if: question 5: yes and/or
question 6: yes

7. With which of the following disturbances have you been familiar before date letter I ? (or more possibilities)

no	0
hypertension	1
hypercholesterolemia	3
disturbed G.T.T.	5

8. Have our determinations been repeated by you or at your request after you had received our letter ?

	impossible to check	yes	no
8.1. bloodpressure			
8.2. cholesterol			
8.3. G.T.T.			

9. If so, by whom? (one or more possibilities)

general practitioner	1
internist	3
cardiologist	5
other specialist	10

10. Have the results confirmed our findings (again deviating from the standard) ?

	impossible to check	yes	no
10.1 bloodpressure			
10.2 cholesterol			
10.3 G.T.T.			

11. Which were the findings ?

	measured value	impossible to check	1	2	3
11.1. bldpr. (P_d mm Hg)			< 100	⩾100	
11.2. chol. (mg%) *			< 260	260-300	⩾300
11.3. G.T.T. (mmol/l)			< 5,6	5,6-6,6	⩾6,6

* Place where determined ?

12. Has a treatment been prescribed ?

	impossible to check	yes	no
12.1. hypertension			
12.2. hypercholesterolemia			
12.3. disturbed G.T.T.			

13. Who took care of the treatment (or more possibilities) ?

general practitioner	1
internist	3
cardiologist	5
other specialist	10

14. If patient has not been remitted, what has been the main reason not to send him on ?

- impossible to check [0]
- indication not serious enough [1]
- I have all facilities for further diagnosis and assistance [2]
- remittance to specialist difficult because of:
  - age [3]
  - distance [4]
  - time burden [5]
  - (over)burdening specialist [6]
  - other reasons, such as [7]

When question 12 confirmative, please answer also question 15 and 16.

15. What sort of treatment has been given ?

	impossible to check	diet/ regimen advice *)	medica- mental **)	both *) **)
15.1. hypertension				
15.2. hypercholesterolemia				
15.3. disturbed G.T.T.				

*) which advice .....
**) which medication.....

16. Has the manner of treatment changed during accompaniment ?

	impossible to check	yes	no
16.1. hypertension			
16.2. hypercholesterolemia			
16.3. disturbed G.T.T.			

If question 16 has been answered with yes, please answer question 17 also.

17. In which way has the method of treatment been changed ?

	impossible to check	diet/ regimen advice *)	medica- mental**)	both *) **)
17.1. hypertension				
17.2. hypercholesterolemia				
17.3. disturbed G.T.T.				

*) which advice .....
**) which medication .....

18. Are there regular check-ups ?

- impossible to check [0]
- at least once a month [1]
- at least once 3 months [2]
- at least once 6 months [3]
- at least once 12 months [4]

19. Has the person examined been satisfied or dissatisfied as regards examination or advice O.H.S. ?

19.1 As regards examination ?
When dissatisfied (4; 5) why ? .....

impossible to check [0]
satisfied [1] [2] [3] [4]
dissatisfied [5]

19.2. As regards advice ?
When dissatisfied (4; 5) why ? .....

impossible to check [0]
satisfied [1] [2] [3] [4]
dissatisfied [5]

20. Did you observe undesired side effects with the above mentioned person examined as regards examination or advice (fear, disturbance psychic equilibrium and such).

20.1. As regards examination ?
If so, which ? .....

impossible to check [0]
yes [1]
no [2]

20.2. As regards advice given ?
If so, which ? .....

impossible to check [0]
yes [1]
no [2]

PART II Patient number [ ][ ][ ]

21. Do you consider large scale cardiovascular screening-examination significant at this moment in The Netherlands ?

no opinion [0]
recommendable [1] [2] [3] [4]
not appropriate [5]

22. Do you think that tracing of "high risk" groups as regards cardiovascular heart diseases must be effected by:
Which other method ? .....

screening teams [1]
general practitioner [2]
other method [3]

23. When large scale screening examination on cardiovascular heart diseases will be organized, many people in the "high risk" group will be traced. Do you consider accompaniment of these people by you as general practitioner feasable ?

no opinion [0]
fully [1] [2] [3] [4]
absolutely not [5]

24.1. Do you expect that when cardiovascular screening teams will check your patients every three years this will have favourable or unfavourable effect on the physical state of health of the people ?

no opinion [0]
favourable [1] [2] [3] [4]
unfavourable [5]

24.2. Do you expect that when cardiovascular screening teams will check your patients every three years this will have favourable or unfavourable effect on the mental state of health of the people ?

- no opinion [0]
- favourable [1]
- [2]
- [3]
- [4]
- unfavourable [5]

25. Do you expect that when screening teams will check your patients every three years this will change your consulting hours quantitatively in the sense of :

- no opinion [0]
- busier [1]
- no influence [2]
- less busy [3]

26.1. Do you think that a decrease of risk factors will reduce the chance of cardiovascular diseases for adults under 40 ?

- no opinion [0]
- yes [1]
- no [2]

26.2. for people of 40 - 55 years ?

- no opinion [0]
- yes [1]
- no [2]

26.3. for people of 55 - 65 years ?

- no opinion [0]
- yes [1]
- no [2]

26.4. for people over 65 ?

- no opinion [0]
- yes [1]
- no [2]

27.1. Do you consider cardiovascular screening by our standards, excl. exercise testing as possible to be realised by you as general practitioner at your present working conditions for adult patients under 40 ?

- no opinion [0]
- yes [1]
- no [2]

27.2. for people of 40 - 55 years ?

- no opinion [0]
- yes [1]
- no [2]

27.3. for people of 55 - 65 years ?

- no opinion [0]
- yes [1]
- no [2]

27.4. for people over 65 ?

- no opinion [0]
- yes [1]
- no [2]

28. When the answer is no, what is the major reason ?

- insufficient knowledge of ECG's [1]
- no time [2]
- too large practice [3]
- insufficient staff [4]
- insufficient accommodation [5]
- no laboratory available [6]
- not interested [7]
- consider it inappropriate [8]
- other impediments, such as [9]

.....

29. Do you have your own ECG facilities available ?

- yes [1]
- no [2]

30. Do you judge the ECG's yourself ?

- yes [1]
- no [2]

31. Who do you consider the right person to tell the results of a screening examination to the person examined ?

31.1. When no abnormalities have been found ?

- screening team [1]
- general practitioner [2]
- to be decide independently for each case [3]
- otherwise, such as ..... [4]

31.2. In case of borderline abnormalities ?

- screening team [1]
- general practitioner [2]
- to be decided independently for each case [3]
- otherwise, such as ..... [4]

31.3 In case of pathology ?

- screening team [1]
- general practitioner [2]
- to be decided independently for each case [3]
- otherwise, such as ..... [4]

32. Do you consider it acceptable that in case of borderline abnormalities screening teams give the following advice without referring to the general practitioner: lose weight, stop smoking, diet low in cholesterol, diet low in salt ?

- no opinion [0]
- acceptable [1]
- [2]
- [3]
- [4]
- unacceptable [5]

33. Do you feel the need of a possibility to refer people within your practice at your initiative, to be checked by a cardiovascular screening team ?

- no opinion [0]
- regularly [1]
- seldom [2]
- no [3]

34. Which information do you prefer from a screening team ?

- extensive policy suggestion [1]
- concise with policy suggestion [2]
- extensive without policy suggestion [3]
- concise without policy suggestion [4]

35. Do you consider the performance of a screening examination by an Occupational Health Service right ?

- no opinion [0]
- correct [1]
- [2]
- [3]
- [4]
- incorrect [5]

36. Do you consider it a motivation of an O. H. S. to perform a screening test in the interest of the man or of the company ?

no opinion	0
interest man	1
	2
	3
	4
interest company	5

37. Generally speaking, have you had favourable or unfavourable experiences with industrial physicians ?

no opinion	0
favourable	1
	2
	3
	4
unfavourable	5

38. What is the total number of patients in your practice (National Health + private patients) ?

< 2000	1
2000 - 2499	2
2500 - 2999	3
3000 - 3499	4
⩾3500	5

39. Do you have subsidiary functions, medical or not medical ?

yes	1
no	2

40. If question 39 yes:
which subsidiary function(s) do you have ?

medical adviser insurance company	1
controlling of patients	3
occupational health officer	5
N.V.S.H. physician (= Dutch Society for Sexual Reform)	10
other	20

41. If question 39 yes :
How many hours a week do you spend in your subsidiary function (s) ?

< 4 hours	1
4 - 8 hours	2
8 - 16 hours	3
⩾16 hours	4

42. For how many years have you been a general practitioner ?

⩽ 5 years	1
6 - 10 years	2
11 - 15 years	3
16 - 20 years	4
21 - 25 years	5
⩾ 26 years	6

HUISARTSEN VRAGENLIJST

patiëntnummer :
datum enquête :
naam patiënt : _____
adres : _____
woonplaats : _____

funktie voor onderzoek I : _____
funktie na onderzoek I : _____
funktie na onderzoek II : _____

huidige huisarts (onderzoek II) no. :
naam : _____
adres : _____
woonplaats : _____

event. vorige huisarts (onderzoek I) no. :
naam : _____
adres : _____
woonplaats : _____

datum brief I :
datum brief II :

laatste minuut inspanning onderzoek I : ☐ minuut van de fase van ☐☐☐ Watt
laatste minuut inspanning onderzoek II : ☐ minuut van de fase van ☐☐☐ Watt

RISICOPROFIEL	I	II
roken	pos. ☐ neg. ☐	pos. ☐ neg. ☐
bloeddruk	☐☐☐ mm Hg ☐☐☐	☐☐☐ mm Hg ☐☐☐
cholesterol	☐☐☐ mg %	☐☐☐ mg %
totaal lipiden	☐☐☐ mg %	☐☐☐ mg %
gewicht	☐☐☐ kg. .	☐☐☐ kg.
G.T.T.	☐☐ ☐☐ ☐☐	☐☐ ☐☐ ☐☐
ECG - ischaemie	pos. ☐ neg. ☐	pos. ☐ neg. ☐
ritme/gel. stoorn.	pos. ☐ neg. ☐	pos. ☐ neg. ☐
andere afwijkingen	pos. ☐ neg. ☐	pos. ☐ neg. ☐

ONDERZOEK I

bloeddruk	:	onder norm	0
		boven norm	1
cholesterol	:	onder norm	0
		boven norm	1
G.T.T.	:	onder norm	0
		boven norm	1
		niet van toepassing	2

ONDERZOEK II

bloeddruk	:	onder norm	0
		boven norm	1
cholesterol	:	onder norm	0
		boven norm	1
G.T.T.	:	onder norm	0
		boven norm	1
		niet van toepassing	2

DEEL I

1. Heeft u brief II d.d. [ ][ ][ ][ ][ ][ ] ontvangen ?

niet na te gaan		0
ja:	direct van B.G.D.	1
	van geadresseerde	2
neen		3

2. Heeft u brief I d.d. [ ][ ][ ][ ][ ][ ] ontvangen ?

niet na te gaan		0
ja:	direct van B.G.D.	1
	van geadresseerde	2
neen		3

3. Hoe lang behoort patiënt tot uw praktijk ?

< 6 maanden	1
6-12 maanden	2
⩾12 maanden	3

4. Is patiënt verplicht verzekerd (ziekenfonds) ?
Explicatie: mensen met een inkomen net boven de "ziekenfondsgrens" zijn soms niet voor huisartskosten verzekerd waardoor ze eventueel eerder worden verwezen om ze niet op kosten te jagen.

niet na te gaan	0
ja	1
neen	2

5. Heeft patiënt ons advies opgevolgd u te consulteren i.v.m. de door ons gevonden afwijkingen ?

niet na te gaan	0
ja	1
neen	2

6. Indien u brief I heeft ontvangen:
Vormde de door ons verstrekte informatie betreffende pathologie en risicofactoren voor u een aanleiding om een initiatief te nemen ten bate van patiënt (bijv. bezoeken, oproep sturen om op spreekuur te komen e.d.) ?

niet na te gaan	0
ja	1
neen	2

Vragenlijst deel I afmaken indien: vraag 5: ja en/of
vraag 6: ja

7. Welke van de onderstaande afwijkingen waren u reeds bekend voor datum brief I ? (eventueel meerdere mogelijkheden)

geen	0
hypertensie	1
hypercholesterolaemie	3
gestoorde G.T.T.	5

8. Zijn onze bepalingen door of namens u herhaald na ontvangst van onze brief ?

	niet na te gaan	ja	neen
8.1. bloeddruk			
8.2. cholesterol			
8.3. G.T.T.			

9. Zo ja, door wie? (eventueel meerdere mogelijkheden)

huisarts	1
internist	3
cardioloog	5
andere specialist	10

10. Waren de resultaten conform onze bevindingen (wederom afwijkend van de norm) ?

	niet na te gaan	ja	neen
10.1 bloeddruk			
10.2 cholesterol			
10.3 G.T.T.			

11. Welke waren de bevindingen ?

	gemeten waarde	niet na te gaan	1	2	3
11.1. bldr. (P_d mm Hg)			< 100	⩾100	
11.2. chol. (mg%) *			< 260	260-300	⩾300
11.3. G.T.T. (mmol/l)			< 5,6	5,6-6,6	⩾6,6

* Waar bepaald ? . . . . . .

12. Is behandeling ingesteld ?

	niet na te gaan	ja	neen
12.1. hypertensie			
12.2. hypercholesterolaemie			
12.3. gestoorde G.T.T.			

13. Wie verzorgde de behandeling (eventueel meerdere mogelijkheden) ?

huisarts	1
internist	3
cardioloog	5
andere specialist	10
specialisme	

14. Indien patiënt niet is verwezen, wat was de voornaamste reden om niet te verwijzen ?

- niet na te gaan [0]
- indicatie niet ernstig genoeg [1]
- beschik zelf over alle faciliteiten om verder te diagnostiseren en te begeleiden [2]
- verwijzing naar een specialist is te bezwaarlijk i.v.m.:
  - leeftijd [3]
  - reisafstand [4]
  - tijdsbelasting [5]
  - (over) belasting specialist [6]
  - andere zoals..... [7]

Indien vraag 12 ja, ook vraag 15 en 16 beantwoorden.

15. Welke behandeling vond plaats ?

	niet na te gaan	dieet/ leefregel advies *)	medicamenteus **)	beide *) **)
15.1. hypertensie				
15.2. hypercholesterolaemie				
15.3. gestoorde G.T.T.				

*) welk advies .....
**) welke medicijnen.....

16. Is gedurende de begeleiding de behandelingswijze gewijzigd ?

	niet na te gaan	ja	neen
16.1. hypertensie			
16.2. hypercholesterolaemie			
16.3. gestoorde G.T.T.			

Indien vraag 16 met ja is beantwoord, ook vraag 17 beantwoorden.

17. Op welke manier is de behandelingswijze gewijzigd ?

	niet na te gaan	dieet/ leefregel advies *)	medicamenteus **)	beide *) **)
17.1. hypertensie				
17.2. hypercholesterolaemie				
17.3. gestoorde G.T.T.				

*) welk advies.....
**) welke medicijnen.....

18. Vindt regelmatig contrôle plaats ?

- niet na te gaan [0]
- minstens 1x per maand [1]
- minstens 1x per 3 maanden [2]
- minstens 1x per 6 maanden [3]
- minstens 1x per 12 maanden [4]
- neen [5]

19. Was onderzochte tevreden of ontevreden t.a.v. onderzoek of advisering op de B.G.D. ?

19.1 T.a.v. onderzoek ? — niet na te gaan [0]

Indien ontevreden (4; 5), waarover ?..... — tevreden [1] [2] [3] [4] ontevreden [5]

19.2. T.a.v. advisering ? — niet na te gaan [0]

Indien ontevreden (4; 5), waarover ?..... — tevreden [1] [2] [3] [4] ontevreden [5]

20. Heeft u bij bovenstaande onderzochte ongewenste bijwerkingen geconstateerd t.g.v. onderzoek of advisering (angst, verstoring psychisch evenwicht, e.d.) ?

20.1. T.g.v. onderzoek ? — niet na te gaan [0]

Indien ja, welke ?..... — ja [1] neen [2]

20.2. T.g.v. advisering ? — niet na te gaan [0]

Indien ja, welke ?..... — ja [1] neen [2]

DEEL II

Patientnummer [ ][ ][ ]

21. Acht u het zinvol op dit moment op grote schaal cardiovasculair screeningsonderzoek te gaan verrichten in Nederland ? — geen mening [0] toe te juichen [1] [2] [3] [4] niet zinvol [5]

22. Bent u van mening dat opsporing van "high risk" groepen t.a.v. cardiovasculaire hartziekten dient te geschieden door — screeningsteams [1] huisarts [2]

Op welke andere wijze ?..... — andere wijze [3]

23. Bij screeningsonderzoek op cardiovasculaire hartziekten op grote schaal zullen veel mensen, behorende tot de ,, high risk'' groep opgespoord worden. Acht u begeleiding van deze mensen door u als huisarts mogelijk ? — geen mening [0] volledig [1] [2] [3] [4] absoluut niet [5]

24.1. Verwacht u, dat indien cardiovasculaire screeningsteams driejaarlijks uw patiënten onderzoeken dit een gunstige of ongunstige invloed zal hebben op de lichamelijke gezondheidstoestand van de mensen ? — geen mening [0] gunstig [1] [2] [3] [4] ongunstig [5]

24.2. Verwacht u, dat indien cardiovasculaire screeningsteams driejaarlijks uw patiënten onderzoeken dit een gunstige of ongunstige invloed zal hebben op de geestelijke gezondheidstoestand van de mensen ?	geen mening	[0]
	gunstig	[1]
		[2]
		[3]
		[4]
	ongunstig	[5]
25. Verwacht u, dat indien screeningsteams driejaarlijks uw patiënten onderzoeken uw spreekuur daardoor kwantitatief verandert in de zin van:	geen mening	[0]
	drukker	[1]
	niet beinvloed	[2]
	minder druk	[3]
26.1. Bent u van mening dat verlagen van de risicofactoren de kans op cardiovasculaire ziekten vermindert bij volwassenen onder de 40 jaar ?	geen mening	[0]
	ja	[1]
	neen	[2]
26.2. Bij mensen van 40 - 55 jaar ?	geen mening	[0]
	ja	[1]
	neen	[2]
26.3. Bij mensen van 55 - 65 jaar ?	geen mening	[0]
	ja	[1]
	neen	[2]
26.4. Bij mensen boven 65 jaar ?	geen mening	[0]
	ja	[1]
	neen	[2]
27.1. Acht u cardiovasculaire screening volgens onze normen, excl. inspanningsonderzoek door u als huisarts realiseerbaar onder uw huidige werkomstandigheden bij uw volwassen patiënten onder de 40 jaar ?	geen mening	[0]
	ja	[1]
	neen	[2]
27.2. Bij mensen van 40 -55 jaar ?	geen mening	[0]
	ja	[1]
	neen	[2]
27.3. Bij mensen van 55 - 65 jaar ?	geen mening	[0]
	ja	[1]
	neen	[2]
27.4. Bij mensen boven 65 jaar ?	geen mening	[0]
	ja	[1]
	neen	[2]
28. Indien neen, wat vormt de voornaamste belemmering ?	onvoldoende kennis van ECG's	[1]
	geen tijd	[2]
	te grote praktijk	[3]
	onvoldoende personeel	[4]
	onvoldoende ruimte	[5]
	geen laboratorium ter beschikking	[6]
	geen interesse	[7]
	acht het niet zinvol	[8]
	andere belemmeringen zoals	[9]
	.....	

29. Heeft u de beschikking over een eigen ECG apparaat?

ja [1]
neen [2]

30. Beoordeelt u zelf de ECG's ?

ja [1]
neen [2]

31. Wie dient het resultaat van een screeningsonderzoek naar uw mening aan de onderzochte mede te delen ?

31.1. Indien er geen bijzonderheden zijn gevonden:

screeningsteam [1]
huisarts [2]
per geval beoordelen [3]
anders zoals ..... [4]

31.2. Bij borderline afwijkingen :

screeningsteam [1]
huisarts [2]
per geval beoordelen [3]
anders zoals ..... [4]

31.3. Bij pathologie :

screeningsteam [1]
huisarts [2]
per geval beoordelen [3]
anders zoals ..... [4]

32. Acht u het aanvaardbaar dat screeningsteams bij borderline afwijkingen zonder verwijzing naar de huisarts de volgende adviezen geven:

vermageren, roken staken, cholesterolarm dieet volgen, zoutgebruik beperken ?

geen mening [0]
aanvaardbaar [1]
[2]
[3]
[4]
onaanvaardbaar [5]

33. Heeft u behoefte aan de mogelijkheid om personen uit uw praktijk op uw initiatief naar het onderzoek van een cardiovasculair screeningsteam te verwijzen ?

geen mening [0]
regelmatig [1]
sporadisch [2]
neen [3]

34. Welke berichtgeving prefereert u van een screeningsteam ?

uitvoerig met beleidsvoorstel [1]
beknopt met beleidsvoorstel [2]
uitvoerig zonder beleidsvoorstel [3]
beknopt zonder beleidsvoorstel [4]

35. Vindt u het verrichten van screeningsonderzoek door een Bedrijfsgeneeskundige Dienst juist ?

geen mening [0]
juist [1]
[2]
[3]
[4]
onjuist [5]

36. Ziet u als motivatie van een B.G.D. om screeningsonderzoek te doen het belang van de man of dat van het bedrijf ?

geen mening	0
belang man	1
	2
	3
	4
belang bedrijf	5

37. Heeft u in het algemeen gunstige of ongunstige ervaringen met bedrijfsartsen ?

geen mening	0
gunstig	1
	2
	3
	4
ongunstig	5

38. Hoeveel patiënten omvat uw praktijk totaal ? (ziekenfonds + particuliere patiënten)

< 2000	1
2000 - 2499	2
2500 - 2999	3
3000 - 3499	4
⩾3500	5

39. Heeft u één of meer al of niet medische nevenfunkties ?

ja	1
neen	2

40. Indien vraag 39 ja:
welke nevenfunktie(s) heeft u ?

medisch adviseur verzekeringsmij	1
ziektecontrôle	3
bedrijfsarts	5
N.V.S.H. arts	10
andere	20

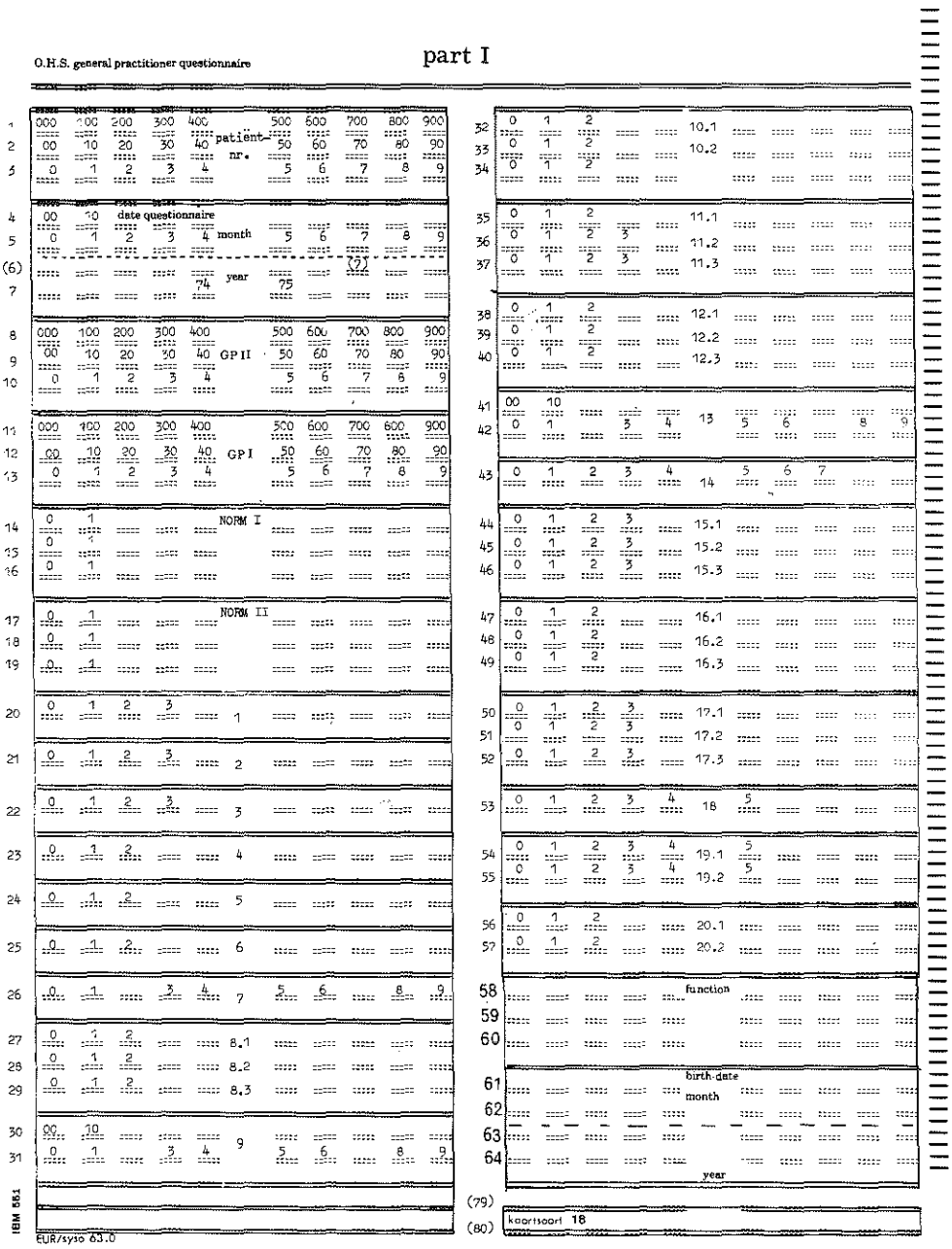
41. Indien vraag 39 ja:
Hoeveel uur per week besteedt u aan uw nevenfunktie(s) ?

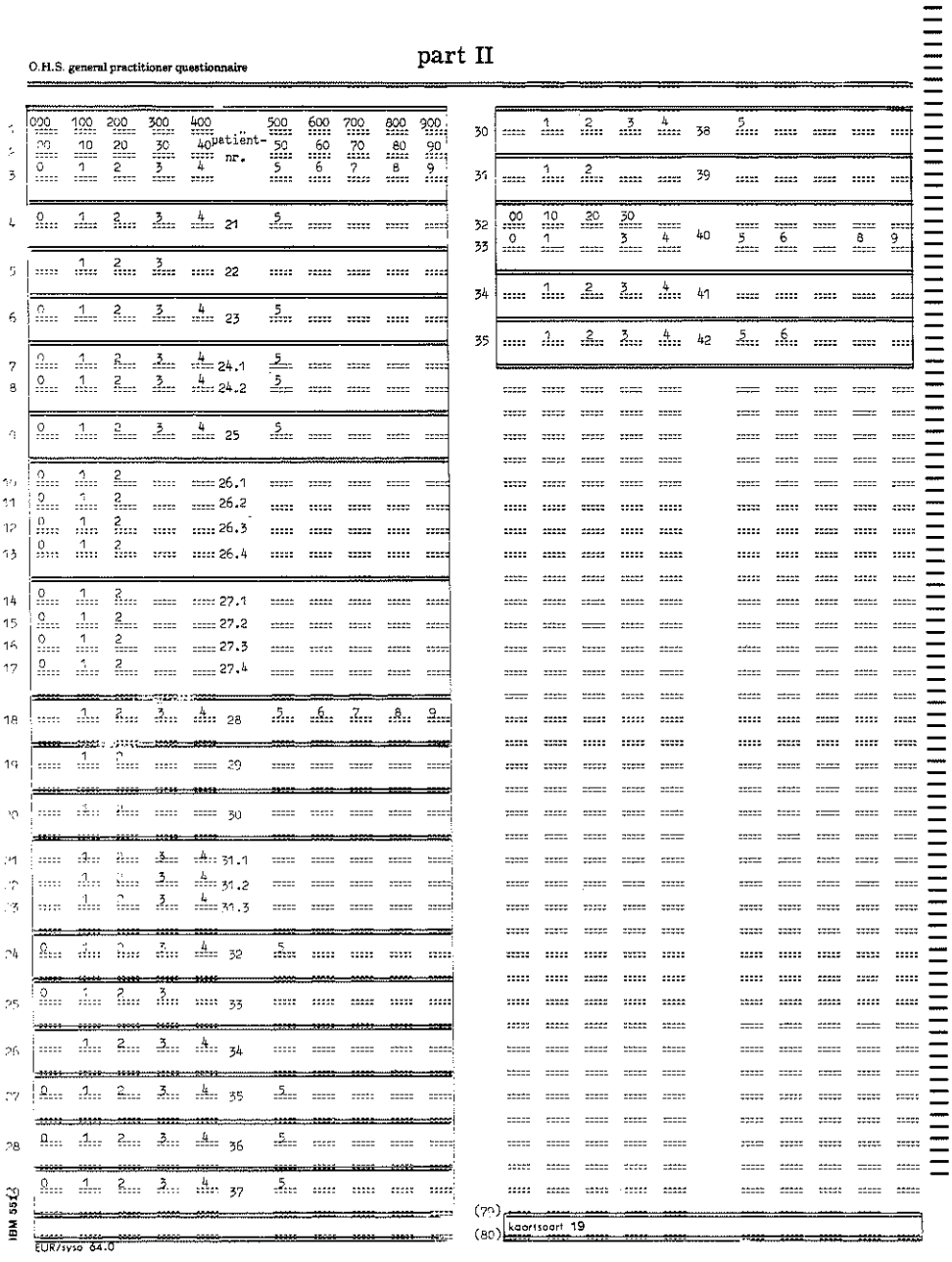
< 4 uur	1
4 - 8 uur	2
8 - 16 uur	3
⩾16 uur	4

42. Hoeveel jaar bent u reeds huisarts ?

⩽5 jaar	1
6 - 10 jaar	2
11 - 15 jaar	3
16 - 20 jaar	4
21 - 25 jaar	5
⩾26 jaar	6

MARK SENSING FORM




O.H.S. general practitioner questionnaire
part II
patient-nr.
kaartsoort 19
IBM 5512
EUR/svso 84.0

ANNEX 22 *CHAPTER V*

EXTREME VALUES

Cardiac frequency (b/min)	< 50	> 100
Systolic blood pressure in recumbent position (mm Hg)	< 100	> 180
Diastolic blood pressure in recumbent position (phase IV)	< 70	> 100
Diastolic blood pressure in recumbent position (phase V)	< 70	> 100
Length (cm)	< 160	> 200
Weight (kg)	< 60	> 100
Hb (mmol/l)	< 6,0	> 11,0
Fasting serum cholesterol (g/l)	< 2,0	> 3,6
Fasting total lipids (g/l)	< 6,0	> 12,0
Fasting bloodsugar (mmol/l)	< 3,0	> 6,7
F.E.V. $_{1\ sec.}$ (1)	< 1,0	> 3,0
F.E.V. $_{5\ sec.}$ (1)	< 2,0	> 5,0
V.C. exp. (1)	< 2,0	> 5,0
Systolic blood pressure during exercise (mm Hg)	< 100	> 280
Diastolic blood pressure during exercise (mm Hg)		> 120
Respiratory frequency during exercise (R/min)	< 10	> 180
Cardiac frequency during exercise (B/min)	< 50	> 180

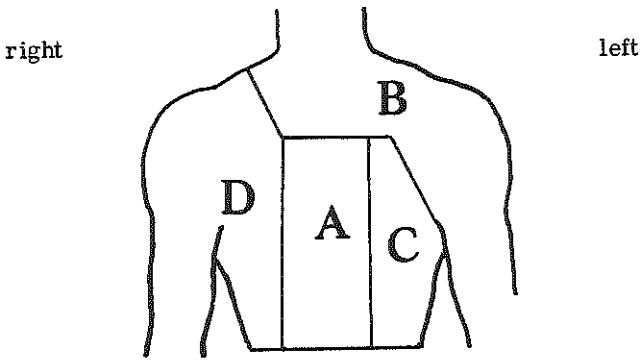
ANNEX 23 *CHAPTER VI*

ANSWERING OF QUESTION B8 OF THE QUESTIONNAIRE PERIODICAL MEDICAL EXAMINATION "COPIH"

SCREENING I			SCREENING II				
Location			A + B	A	B	C	D
A + B	2	2.7			1.3	1.3	
A	39	52.0		26.7	2.7	17.3	5.3
B	4	5.3	1.3	1.3	1.3	1.3	
C	26	34.7		12.0	2.7	13.3	6.7
D	4	5.3		4.0		1.3	
Total	75	100.0	1.3	44.0	8.0	34.7	12.0
Numbers		Percentages					

Will you mark where this pain or pressure was generally located ?

Location of chest complaints.



ANNEX 24 *CHAPTER VI*

ANSWERING OF QUESTION F2 OF THE QUESTIONNAIRE PERIODICAL MEDICAL EXAMINATION "COPIH"

"How many cigarettes do you smoke per day (including handrolled cigarettes)?"

SCREENING I			SCREENING II				
cigarettes per day			cigarettes per day				
			0	1-10	10-20	20-30	⩾30
0	90	21.3	19.9	0.7	0.7		
1 -10	81	19.2	2.4	14.0	2.8		
10-20	225	53.3	4.0	13.3	34.6	1.4	
20-30	24	5.7	0.9	0.7	0.7	3.1	0.2
⩾ 30	2	0.5			0.2		0.2
Total	422	100.0	27.3	28.7	39.1	4.5	0.5
Numbers		Percentages					

ANNEX 25 *CHAPTER VI*

CODING LIST REST-ECG ACCORDING TO MINNESOTA CODE

CODING LIST - ECG's

Subject number : ☐☐☐☐☐

Date : ☐☐☐☐

Name :

Birth-date : ☐☐☐☐

Serial number ECG : ☐

MINNESOTA CODE (1968)

Column	Code		Column	Code
67	0	No ECG available	67	☐
	1	1e ECG		☐
	2	2e ECG		☐
	3	3e ECG		☐
	4	4e ECG		☐
	5	5e ECG		☐
	6	6e ECG		☐
	7	7e ECG		☐
	8	8e ECG		☐
	9	9e ECG		☐
68	0	No Q pathology	68	☐
	1	Class I (any of 1-1-1 through 1-1-7)		☐
		1-1-1 Q/R amplitude ratio 1/3 or more plus Q duration 0.03 sec or more in any of leads I,II,V2,3,4,5,6		
		1-1-2 Q duration 0.04 sec or more in any of leads I,II,V1,2,3,4,5,6		
		1-1-3 Q duration 0.04 sec or more, plus R amplitude of 3 mm or more in lead aVL		
		1-1-4 Q duration 0.05 sec or more in lead III plus any Q wave of at least 1.0 mm amplitude in aVF		
		1-1-5 Q duration 0.05 sec or more in lead aVF		
		1-1-6 QS pattern when R wave is present in adjacent lead to the right on the chest in any of leads V2,3,4,5,6		
		1-1-7 QS pattern in all of leads V1-V4,V1-V5 or V1-V6		

Column	Code		Column	Code
68	2	Class II (any of 1-2-1 through 1-2-8)	68	☐
		1-2-1 Q/R amplitude ratio 1/3 or more, plus Q duration at least 0.02 sec and less than 0.03 sec in any of leads I,II,V2,3,4,5,6		
		1-2-2 Q duration at least 0.03 sec and less than 0.04 sec in any of leads I,II,V2,3,4,5,6		
		1-2-3 QS pattern in lead II		
		1-2-4 Q duration of at least 0.04 sec and less than 0.05 sec in lead III, plus any Q wave of at least 1.0 mm amplitude in aVF		
		1-2-5 Q duration at least 0.04 sec and less than 0.05 sec in lead aVF		
		1-2-6 Q amplitude of 5 mm or more in either of leads III,aVF		
		1-2-7 QS pattern in all of leads V1 through V3		
		1-2-8 R amplitude decreasing to 2 mm or less, and absence of codes 3-2,7-2, or 7-3, between any of leads V2 and V3,V3 and V4,V4 and V5, or V5 and V6		
68	3	Class III (any of 1-3-1 through 1-3-6)	68	☐
		1-3-1 Q/R amplitude ratio at least 1/5 and less than 1/3 plus Q duration of at least 0.02 sec and less than 0.03 sec in any of leads I,II,V2,3,4,5,6		
		1-3-2 QS pattern in absence of code 3-1, in each of leads V1 and V2		
		1-3-3 Q duration of at least 0.03 sec and less than 0.04 sec, plus R amplitude of 3 mm or more in lead aVL		
		1-3-4 Q duration of at least 0.03 sec and less than 0.04 sec in lead III, plus any Q wave of at least 1.0 mm amplitude in lead aVF		
		1-3-5 Q duration of at least 0.03 sec and less than 0.04 sec in lead aVF		
		1-3-6 QS pattern in each of leads III and aVF		

Column	Code			Column	Code
69	0		Geen QRS as deviatie	69	☐
	1	2-1	Left: QRS axis from -30° through -90° in leads I,II,III. (The algebraic sum of major positive and major negative QRS waves must be zero or positive in I, negative in III, and zero or negative in II).		☐
	2	2-2	Right: QRS axis from $+120^{\circ}$ through -150° in leads I,II,III. (The algebraic sum of major positive and major negative QRS waves must be negative in I, and zero or positive in III, and in I must be one-half or more of that in III.)		☐
	3	2-3	Right (optional code when 2-2 is not present): QRS axis from $+90^{\circ}$ through $+119^{\circ}$ in leads I,II,III. (The algebraic sum of major positive and major negative QRS waves must be zero or negative in I and positive in II and III.)		☐
	4	2-4	Extreme axis deviation (usually S1,S2,S3 pattern): QRS axis from -90° through -149° in leads I,II and III. (The algebraic sum of major positive and major negative QRS waves must be negative in each of leads I,II and III.)		☐
	5	2-5	Indeterminate axis: QRS axis approximately 90° from the frontal plane. (The algebraic sum of major positive and major negative QRS waves is zero in each of leads I,II and III, or the information from these three leads is incongruous.)		☐
70	0		No high amplitude R waves	70	☐
	1	3-1	Left: R amplitude greater than 26 mm in either of leads V5 or 6; or R amplitude greater than 20 mm in any of leads I,II,III, aVF; or R amplitude greater than 12 mm in lead aVL		☐
	2	3-2	Right: R amplitude equal to or greater than 5.0 mm and R amplitude equal to or greater than S amplitude in lead V1, when a decreasing R/S amplitude ratio occurs somewhere to the left of V1 on the chest. (Includes code 7-3, which meets the above criteria.)		☐
	3	3-3	Left (optional code when 3-1 is not present): R amplitude greater than 15 mm but less than 20 mm in lead I, or R amplitude in V5 or 6, plus S amplitude in V1 greater than 35 mm.		☐

Column	Code		Column	Code
71	0	Normal ST segment	71	☐
	1	4-1 S-T-J depression 1.0 mm or more and S-T segment horizontal or downward sloping in any of leads I,II,aVL,aVF,V1,2,3,4,5,6 (requires a T-wave code in 5).		☐
	2	4-2 S-T-J depression at least 0.5 mm and less than 1.0 mm and S-T segment horizontal or downward sloping in any of leads I,II,aVL,aVF,V1,2,3,4,5,6. (Requires a T-wave code in 5.)		☐
	3	4-3 No S-T-J depression as much as 0.5 mm, but S-T segment downward sloping and segment or T-wave nadir at least 0.5 mm below P-R baseline in any of leads I,II,aVL,V2,3,4,5,6. (Requires a T-wave code in 5.)		☐
	4	4-4 S-T-J depression of 1.0 mm or more and S-T segment upward sloping, or U-shaped, in any of leads I,II,aVL,V1,2,3,4,5,6.		☐
72	0	No T wave disturbances	72	☐
	1	5-1 T amplitude negative, minus 5 mm or more in any of leads I,II,V2,3,4,5,6 or in lead aVL when R amplitude is 5 mm or more, or in lead aVF when QRS is mainly upright.		☐
	2	5-2 T amplitude negative or diphasic (positive-negative or negative-positive type) with negative phase at least minus 1.0 mm but not as deep as minus 5 mm in any of leads I,II,V2,3,4,5,6 or in lead aVL when R amplitude is 5 mm or more, or in lead aVF when QRS is mainly upright.		☐
	3	5-3 T amplitude zero (flat), or negative, or diphasic (negative-positive type) with less than 1.0 mm negative phase in any of leads I,II,V3,4,5,6, or in lead aVL when R amplitude is 5 mm or more, not coded in lead aVF.		☐
	4	5-4 (Optional code): T amplitude positive and T/R amplitude ratio less than 1/20 in any of leads I,II,aVL,V3,4,5,6; R-wave amplitude must be 10 mm or more.		☐

Column	Code			Column	Code
73	0		Normal A-V conduction	73	☐
	1	6-1	Complete (third degree) A-V block (permanent or intermittent) in any lead.		☐
	2	6-2	Partial (second degree) A-V block in any lead. (2:1 or 3:1 block, Wenckebach, etc.)		☐
	3	6-3	P-R (P-Q) interval 0.22 sec or more in any of leads I,II,III,aVL,aVF.		☐
	4	6-4	Wolff-Parkinson-White syndrome: P-R (P-Q) interval less than 0.12 sec, plus QRS duration 0.12 sec or more, plus R peak duration 0.06 sec or more, coexisting in the same beats of any of leads I,II,aVL,V4,5, or 6.		☐
	5	6-5	Short P-R (P-Q) interval: P-R (P-Q) interval less than 0.12 sec in all beats in any two of the following leads: I,II,III,aVL,aVF (in the absence of 8-6 and 8-7).		☐
74	0		Normal intraventricular conduction	74	☐
	1	7-1	Complete left bundle branch block (in absence of 6-4): QRS duration 0.12 sec or more in any of leads I,II, III,aVL,aVF; and R peak duration 0.06 sec or more, and the absence of codable Q waves, in any of leads I,II,aVL,V5,6.		☐
	2	7-2	Complete right bundle branch block (in absence of 6-4): QRS duration 0.12 sec or more in any of leads I,II, III,aVL,aVF plus R prime greater than R, or R peak duration 0.06 sec or more in either of leads V1,V2.		☐
	3	7-3	Incomplete right bundle branch block: QRS duration less than 0.12 sec in each of leads I,II,III,aVL,aVF and R prime greater than R in either of leads V1,2. (Report as 3-2 if those criteria are met.)		☐
	4	7-4	Intraventricular block (in absence of 6-4, 7-1, or 7-2): QRS duration 0.12 sec or more in any of leads I,II,III,aVL,aVF.		☐
	5	7-5	R-R prime, not meeting criteria of 7-2 or 7-3, in either of leads V1 or V2.		☐
	6	7-6	Incomplete left bundle branch block: QRS duration at least 0.10 sec and less than 0.12 sec, in the absence of codable Q waves, in each of leads I,aVL, and V5 or V6.		☐

Column	Code			Column	Code
75	0		No arrhythmias	75	☐
	1	8-1	Frequent premature atrial, nodal, or ventricular beats (10% or more of recorded cycles).		☐
	2	8-2	Ventricular tachycardia (over 100/min).		☐
	3	8-3	Atrial fibrillation or flutter.		☐
	4	8-4	Supraventricular tachycardia (over 100/min).		☐
	5	8-5	Ventricular (idioventricular) rhythm (up to 100/min).		☐
	6	8-6	A-V nodal rhythm (up to 100/min). Defined as a negative P wave in lead aVF plus a P-R interval of 0.12 sec or less in any two of leads I,II,III,aVL,aVF.		☐
	7	8-7	Sinus tachycardia (over 100/min).		☐
	8	8-8	Sinus bradycardia (under 50/min).		☐
	9	8-0 8-9	Any combination of arrhythmias above or arrhythmias not mentioned above.		☐
76	0		No "miscellaneous" disturbances	76	☐
	1	9-1	Low QRS amplitude: QRS peak-to-peak amplitude less than 5 mm in each of leads I,II,III, or QRS peak-to-peak amplitude less than 10 mm in each of leads V1,2,3,4,5,6.		☐
	2	9-2	S-T segment maximum elevation or 1.0 mm or more in any of leads I,II,III,aVL,aVF,V5 or V6, or S-T segment maximum elevation of 2.0 mm or more in any of leads V1,V2,V3,V4. (Do not code in the presence of codes 6-4, 7-1, 7-2, or 7-4.)		☐
	3	9-3	P wave amplitude of 2.5 mm or more in any of leads II,III,aVF.		☐
	4	9-4-1	QRS transition zone to the right (on the chest) of lead V3. (Do not code in the presence of codes 6-4, 7-1, 7-2, or 7-4.)		☐
	5	9-4-2	QRS transition zone at lead V4 or to the left of V4 on the chest. (Do not code in the presence of codes 6-4, 7-1, 7-3, or 7-4.)		☐
	6	9-5	T wave amplitude greater than 12 mm in any of leads I,II,III,aVL,aVF,V1,2,3,4,5,6. (Do not code in the presence of codes 6-4, 7-1, 7-2, or 7-4.)		☐
	7	9-8	Findings questionable due to wandering baseline, "noise", or other technical defect in the record.		☐
	8	9-0	Any combination of items above.		☐

Subject number : ☐☐☐☐☐

Date : ☐☐☐☐

Name :

Birth-date : ☐☐☐☐

Serial number ECG : ☐

INTERPRETATION MINNESOTA CODE

Column	Code		Column	Code
25	0	No disturbances	25	☐
	4	Probable IHD (column 68, code 1 or 2 or column 74, code 1)		☐
	3	Possible IHD (column 68, code 3 or column 71, code 1 or 2 or column 72, code 1, 2 or 3)		☐
	2	Column 71, code 3 or 4		☐
	1	Other disturbances according to Minnesota Code		☐

CLINICAL JUDGEMENT ECG

Rhythm :

QRS :

S-T, T :

Advice :

Signature

67	68	69	70	71	72	73	74	75	76

return :

CROSSTABULATION OF THE SYSTOLIC BLOOD PRESSURE (RECUMBENT POSITION) (%)

SCREENING I			SCREENING II								
mm Hg	results screening I	no second screening	known screening II		mm Hg						
					< 120	120-140	140-160	160-180	180-200	200-220	⩾ 220
< 120	10	2	8	1.8	0.7	0.7	0.4				
120-140	147	12	135	30.3	2.5	11.9	12.6	3.1	0.2		
140-160	203	21	182	40.9	0.2	11.7	19.8	7.2	2.0		
160-180	98	16	82	18.4		1.3	7.0	7.0	2.7	0.2	0.2
180-200	29	3	26	5.8		0.2	1.1	1.6	2.0	0.7	0.2
200-220	10	3	7	1.6				0.2	0.9	0.4	
⩾ 220	5	0	5	1.1				0.2	0.2	0.2	0.4
Total	502	57	445	100.0	3.4	25.8	40.9	19.3	8.1	1.6	0.9
Numbers			Percentages								

0.2 % ≈ 1 person

screening II	screening II - I	
mean	st . dev.	$\bar{V}$
149 mm Hg	20	3 mm Hg

CROSSTABULATION OF THE WEIGHT (%)

SCREENING I			SCREENING II										
kg	results screening I	no second screening	known screening II		kg								
					< 65	65-70	70-75	75-80	80-85	85-90	90-95	95-100	⩾ 100
< 65	94	8	86	19.3	15.7	2.7	0.7	0.2					
65- 70	100	11	89	20.0	2.9	11.2	5.4	0.4					
70- 75	83	13	70	15.7		2.9	7.0	5.2	0.7				
75- 80	78	9	69	15.5		0.2	4.7	6.7	3.8				
80- 85	67	9	58	13.0			0.7	2.5	7.2	2.5	0.2		
85- 90	39	3	36	8.1				0.2	3.6	2.7	1.3	0.2	
90- 95	27	2	25	5.6					0.9	1.1	2.9	0.7	
95-100	6	1	5	1.1							0.2	0.9	
⩾ 100	8	1	7	1.6						0.2	0.2		1.1
Total	502	57	445	100.0	18.7	17.1	18.4	15.3	16.2	6.5	4.9	1.8	1.1
Numbers			Percentages										

0,2 % ≈ 1 person

screening II		screening II - I
mean	st. dev.	$\overline{V}$
74.5 kg	10.3	0.3 kg

CROSSTABULATION OF THE INDEX OF QUETELET (%)

SCREENING I			SCREENING II						
Kg/m^2 x 10	results screening I	no second screening	known screening II		Kg/m^2 x 10				
					< 200	200-220	220-240	240-260	⩾ 260
< 200	19	2	17	3.8	2.2	1.1	0.4		
200-220	66	5	61	13.7	0.7	8.5	4.0	0.4	
220-240	93	7	86	19.3		2.7	9.9	5.4	1.3
240-260	124	19	105	23.6		0.2	2.5	15.5	5.4
⩾ 260	200	24	176	39.6			0.4	4.9	34.2
Total	502	57	445	100.0	2.9	12.6	17.3	26.3	40.9
Numbers			Percentages						

0.2 % ≈ 1 person

screening II:

mean	st. dev.
253.2	30.4

screening II-I:

$\overline{V}$
1.0

CROSSTABULATION OF THE FORCED EXPIRATORY VOLUME 1 SEC. (%)

SCREENING I			SCREENING II										
					litres								
litres	results screening I	no second screening	known screening II		< 1	1-1.5	1.5-2	2-2.5	2.5-3	3-3.5	3.5-4	⩾ 4
< 1	1	0	1	0.2	0.2							
1-1.5	12	1	11	2.5		2.0	0.4					
1.5-2	42	9	33	7.4		1.1	5.2	1.1				
2-2.5	124	20	104	23.4		0.7	4.5	14.8	3.4			
2.5-3	179	17	162	36.4			0.4	12.6	20.7	2.7		
3-3.5	114	7	107	24.0			0.4	0.9	10.8	11.5	0.4	
3.5-4	23	2	21	4.7						4.0	0.7	
⩾ 4	6	0	6	1.3							1.3	
Total	501	56	445	100.0	0.2	3.8	11.0	29.4	34.8	18.2	2.5	0.0
Numbers					Percentages							

0.2 % ≈ 1 person

screening II

mean	st dev.
2.52 l.	0.54

screening II - I

$\overline{V}$

− 0.16 l.

CROSSTABULATION OF THE FORCED EXPIRATORY VOLUME 5 SEC. (%)

SCREENING I			SCREENING II								
litres	results screening I	no second screening	known screening II	litres							
				< 3	3-3.5	3.5-4	4-4.5	4.5-5	5-5.5	⩾ 5.5
< 3	63	10	53	10.5	1.3					
3-3.5	104	17	87	6.1	11.9	1.6				
3.5-4	167	19	148	1.6	15.7	15.5	0.4			
4-4.5	119	7	112	0.4	0.9	12.6	11.0	0.2		
4.5-5	41	3	38			0.7	6.1	1.6	0.2	
5-5.5	6	0	6					1.3		
⩾ 5.5	2	0	2					0.2	0.2	
Total	502	56	446	18.6	29.8	30.3	17.5	3.4	0.4	0.0
Numbers			Percentages							

0.2 % ≈ 1 person

screening II

mean 3.48 l.

st. dev. 0.60

screening II - I

$\bar{V}$ - 0.25 l.

CROSSTABULATION OF THE VITAL CAPACITY (%)

SCREENING I			SCREENING II								
litres	results screening I	no second screening	known screening II		litres						
					< 3	3-3.5	3.5-4	4-4.5	4.5-5	5-5.5	⩾ 5.5
< 3	26	4	22	4.9	4.7	0.2					
3-3.5	78	12	66	14.8	7.2	7.0	0.7				
3.5-4	136	20	116	26.0	0.7	13.5	11.4	0.4			
4-4.5	145	14	131	29.4	0.4	3.1	15.9	9.4	0.4		
4.5-5	86	4	82	18.4	0.2		3.8	9.9	4.3	0.2	
5-5.5	26	2	24	5.4				0.9	3.4	1.1	
⩾ 5.5	5	0	5	1.1					0.7	0.4	
Total	502	56	446	100.0	13.2	23.8	31.8	20.6	8.7	1.8	0.0
Numbers			Percentages								

0.2 % ≈ 1 person

screening II		screening II - I
mean	st. dev.	$\overline{V}$
3.67 l.	0.62	− 0.34 l.

CROSSTABULATION OF THE PEAK EXPIRATORY FLOW RATE (%)

SCREENING I			SCREENING II					
litres/min.	results screening I	no second screening	known screening II		litres/min.			
					< 300	300-400	400-500	500-600	⩾ 600
< 300	51	7	44	10.0	5.2	3.9	0.9		
300-400	107	18	89	20.2	2.0	11.1	6.8	0.2	
400-500	208	23	185	42.0	0.2	3.9	31.7	6.1	
500-600	122	10	112	25.4			9.3	15.0	1.1
⩾ 600	12	1	11	2.5				1.1	1.4
Total	500	59	441	100.0	7.5	18.8	48.8	22.4	2.5
Numbres					Percentages				

0.2 % ≈ 1 person

screening II

mean

436 l/min.

st dev.

89

screening II - I

$\bar{V}$

3 l/min.

CROSSTABULATION OF THE CHEST ROENTGENOGRAM (ODELCA) (%)

SCREENING I			SCREENING II										
* code	results screening I	no second screening	known screening II		code								
					0	1	2	3	4	5	6	7	8
0	229	28	201	45.7	21.1		17.3	4.5			2.0	0.2	0.5
1	24	2	22	5.0	2.0		2.7				0.2		
2	60	5	55	12.5	2.7		9.1	0.5		0.2			
3	93	11	82	18.6	8.0		5.0	3.2		0.2	1.8		0.5
4	20	3	17	3.9	1.4		1.6	0.5	0.5				
5	16	4	12	2.7	0.2		1.4	0.2	0.2	0.5	0.2		
6	41	3	38	8.6	1.8		4.5	2.0			0.2		
7	3	0	3	0.7			0.7						
8	13	3	10	2.3		0.2	1.6	0.2			0.2		
Total	499	59	440	100.0	37.3	0.2	43.9	11.1	0.7	0.9	4.8	0.2	0.9
Numbers					Percentages								

* see for code Chapter III page 49.

0.2 % ≈ 1 person

CROSSTABULATION OF THE HAEMOGLOBIN (%)

SCREENING I			SCREENING II										
					mmol/l								
mmol/l	results screening I	no second screening	known screening II		< 6	6-7	7-8	8-9	9-10	10-11	11-12	⩾ 12
< 6	2	1	1	0.2				0.2				
6-7	2	0	2	0.5				0.5				
7-8	6	0	6	1.4	0.2	0.2	0.2	0.7				
8-9	82	10	72	16.2			0.5	9.2	6.5			
9-10	271	29	242	54.5				14.4	33.8	5.9	0.2	0.2
10-11	125	15	110	24.8	0.2		0.2	1.1	14.2	8.8	0.2	
11-12	7	0	7	1.6					0.2	1.4		
⩾ 12	5	1	4	0.9				0.2	0.5	0.2		
Total	500	56	444	100.0	0.5	0.2	0.9	26.4	55.2	16.2	0.5	0.2
Numbers			Percentages									

0.2 % ≈ 1 person

	screening II	screening II - I
	mean	st. dev.
	9.3 mmol/l	0.8

$\bar{V}$

0.2 mmol/l.

CROSSTABULATION OF THE TOTAL LIPIDS (%)

SCREENING I			SCREENING II									
g/l	results screening I	no second screening	known screening II		g/l							
					< 6	6-7	7-8	8-9	9-10	10-11	11-12	⩾ 12
< 6	38	4	34	7.6	2.0	3.6	1.3	0.4	0.2			
6-7	92	11	81	18.2	1.8	6.7	5.6	2.2	1.8			
7-8	141	16	125	28.1	1.6	5.2	12.8	6.5	2.0			
8-9	103	14	89	20.0	0.2	2.0	8.1	6.7	1.8	0.4	0.7	
9-10	76	7	69	15.5		1.3	3.1	6.7	2.9	1.1	0.2	
10-11	33	2	31	7.0		0.2	1.3	1.8	1.6	1.8	0.2	
11-12	15	1	14	3.1		0.2	0.2	1.1	0.9	0.2		0.4
⩾ 12	3	1	2	0.4						0.2	0.2	
Total	501	56	445	100.0	5.6	19.3	32.6	25.6	11.2	3.8	1.3	0.4
Numbers			Percentages									

0.2 % ≈ 1 person

screening II

mean 7.78 g/l

st. dev. 1.32

screening II - I

$\bar{V}$ − 0.19 g/l

CROSSTABULATION OF THE BLOOD SUGAR (%)

SCREENING I			SCREENING II								
mmol/l	results screening I	no second screening	known screening II		mmol/l						
					< 3.4	3.4-4.5	4.5-5.6	5.6-6.7	6.7-7.8	7.8-8.9	⩾ 8.9
< 3.4	3	0	3	0.7		0.4	0.2				
3.4-4.5	185	16	169	38.0	0.7	22.2	15.1				
4.5-5.6	270	32	238	53.5	0.2	24.9	25.4	2.2	0.2	0.2	0.2
5.6-6.7	33	6	27	6.1		1.1	4.3	0.4	0.2		
6.7-7.8	7	1	6	1.3			0.2	0.9		0.2	
7.8-8.9	1	1	0	0.0							
⩾ 8.9	2	0	2	0.4				0.2			0.2
Total	501	56	445	100.0	0.9	48.8	45.2	3.8	0.4	0.4	0.4
Numbers			Percentages								

0.2 % ≈ 1 person

screening II

mean

4.5 mmol/l

st. dev.

0.9

screening II - I

$\bar{V}$

− 0.2 mmol/l.

RESPIRATORY FREQUENCY IN THE LAST COMPARABLE MINUTE OF THE EXERCISE TEST (%)

b/min.	known screening II		b/min.							
			< 20	20-25	25-30	30-35	35-40	40-45	⩾ 45	
< 20	3	0.8	0.3	0.3		0.3				
20-25	23	6.0		1.6	1.6	0.8	1.0	0.5	0.5	
25-30	82	21.4	0.5	2.3	7.3	7.0	3.1	0.3	0.8	
30-35	116	30.3	0.5	2.1	5.2	11.2	7.3	2.1	1.8	
35-40	86	22.5		0.8	4.2	4.7	8.6	3.7	0.5	
40-45	54	14.1			1.8	2.1	4.4	3.9	1.8	
⩾ 45	19	5.0				0.8	1.3	1.6	1.3	
Total	383	100.0	1.3	7.0	20.1	26.9	25.8	12.0	6.8	
Numbers			Percentages							

CARDIAC FREQUENCY IN THE LAST COMPARABLE MINUTE OF THE EXERCISE TEST (%)

b/min.	known screening II		b/min.									
			< 110	110-120	120-130	130-140	140-150	150-160	160-170	170-180	⩾ 180
< 110	11	2.6	1.0	0.2	1.2	0.2					
110-120	22	5.3	1.4	1.2	1.2	0.7	0.5		0.2		
120-130	44	10.5	2.4	1.9	1.9	2.6	1.0	0.5	0.2		
130-140	48	11.5	1.2	0.5	3.1	2.4	2.6	1.4	0.2		
140-150	78	18.7		1.7	2.4	4.8	5.3	2.6	1.7	0.2	
150-160	90	21.5	0.5		1.9	2.9	5.0	6.2	4.5	0.5	
160-170	93	22.2			0.7	1.4	1.7	8.1	7.7	2.6	
170-180	31	7.4			0.2		0.2	1.0	3.3	2.6	
⩾ 180	1	0.2								0.2	
Total	418	100.0	6.5	5.5	12.7	15.1	16.3	19.9	17.9	6.2	0.0
Numbers			Percentages								

SYSTOLIC BLOOD PRESSURE IN THE LAST COMPARABLE MINUTE OF THE EXERCISE TEST (%)

mm Hg	known screening II		mm Hg								
			< 160	160-180	180-200	200-220	220-240	240-260	260-280	⩾ 280
< 160	2	0.5		0.5						
160-180	18	4.3	0.2	1.2	1.7	0.7	0.2	0.2		
180-200	51	12.2	0.5	0.7	4.1	4.1	2.9			
200-220	86	20.5		1.7	3.1	7.2	6.2	1.7	0.7	
220-240	125	29.8		0.5	1.4	7.9	9.8	8.4	1.7	0.2
240-260	86	20.5		0.2	1.0	2.4	7.2	6.4	2.9	0.5
260-280	36	8.6			0.2	0.2	1.2	4.1	2.4	0.5
⩾ 280	15	3.6				0.2		0.7	1.7	1.0
Total	419	100.0	0.7	4.8	11.5	22.7	27.4	21.5	9.3	2.1
Numbers			Percentages							

ANNEX 42 *CHAPTER VI*

RELATION BETWEEN THE ANSWERS TO QUESTION 42 AND 26 OF THE GENERAL PRACTITIONARS QUESTIONNAIRE

Question 42: For how many years have you been a general practitioner ?

answer :

$\leqslant$ 5 years	16 - 20 years
6 - 10 years	21 - 25 years
11 - 15 years	$\geqslant$ 26 years

Question 26: Do you think that a reduction of the risk factors will reduce the mortality and morbidity risk due to cardiovascular diseases:

question 26.1: adults under 40

26.2: people of 40 - 55 years

26.3: people of 55 - 65 years

26.4: people over 65

answer : no opinion

yes

no

question 26.1	question 42				
	⩽ 5	6-15	16-25	⩾ 26	total
no opinion	1	0	2	0	3
yes 1)	15	38	24	19	96
no 1)	0	0	2	2	4
total	16	38	28	21	103

1) Wilcoxon z = 1.98 P_2 = 0.05; significant

question 26.2	question 42				
	⩽ 5	6-15	16-25	⩾ 26	total
no opinion	3	0	2	0	5
yes 2)	13	37	24	20	94
no 2)	0	1	2	1	4
total	16	38	28	21	103

2) Wilcoxon z = 0.73; not significant

question 26.3	question 42				
	⩽ 5	6-15	16-25	⩾ 26	total
no opinion	2	3	4	1	10
yes 3)	11	30	20	19	80
no 3)	3	5	4	1	13
total	16	38	28	21	103

3) Wilcoxon z = 1.12; not significant

question 26.4	question 42				
	⩽ 5	6-15	16-25	⩾ 26	total
no opinion	2	5	4	1	12
yes 4)	8	24	16	17	65
no 4)	6	9	8	3	26
total	16	38	28	21	103

4) Wilcoxon z = 1.50; not significant

ANNEX 43 *CHAPTER VI*

RELATION BETWEEN THE ANSWERS TO QUESTION 38 AND 26 OF THE GENERAL PRACTITIONERS QUESTIONNAIRE

Question 38: What is the total number of patients in your practice (National Health + private patients) ?

Answer:
- < 2500
- 2500-3500
- > 3500

Question 26: Do you think that a reduction of the risk factors will reduce the mortality and morbidity risk due to cardiovascular diseases for:

- question 26.1: adults under 40
- 26.2: people of 40 - 55 years
- 26.3: people of 55 - 65 years
- 26.4: people over 65

Answer:
- no opinion
- yes
- no

question 26.1	question 38			
	< 2500	2500-3500	> 3500	total
no opinion	0	1	2	3
yes 1)	23	43	30	96
no 1)	0	0	4	4
total	23	44	36	103

1) Wilcoxon z = 2.41; P_2 = 0.02; significant

question 26.2	question 38			
	< 2500	2500-3500	> 3500	total
no opinion	0	3	2	5
yes 2)	22	41	31	94
no 2)	1	0	3	4
total	23	44	36	103

2) Wilcoxon z = 1.15; not significant

question 26.3	question 38			
	< 2500	2500-3500	> 3500	total
no opinion	1	2	7	10
yes 3)	20	35	25	80
no 3)	2	7	4	13
total	23	44	36	103

3) Wilcoxon z = 0.04; not significant

question 26.4	question 38			
	< 2500	2500-3500	> 3500	total
no opinion	2	5	5	12
yes 4)	14	29	22	65
no 4)	7	10	9	26
total	23	44	36	103

4) Wilcoxon z = 0.59; not significant

ANNEX 44 *CHAPTER VI*

RELATION BETWEEN THE ANSWERS TO QUESTION 42 AND 31 OF THE GENERAL PRACTITIONERS QUESTIONNAIRE

question 42 : For how many years have you been a general practitioner ?

answer	:	$\leqslant$ 5 years	16 - 20 years
		6 - 10 years	21 - 25 years
		11 - 15 years	$\geqslant$ 26 years

Question 31: Who do you consider the right person to tell the results of a screening examination to the person examined ?

question 31.1: When no abnormalities have been found

31.2: In case of borderline abnormalities

31.3: In case of pathology

answer : screening team

general practitioner

to be decided independently for each case

otherwise, such as . . . . . .

question 31.1	question 42				
	⩽ 5	11-15	16-20	⩾ 26	total
screening team 1)	11	21	19	9	60
general practitioner 1)	5	16	8	11	40
each case	0	0	0	0	0
otherwise	0	1	1	1	3
total	16	38	28	21	103

1) Wilcoxon z = 0.70; not significant

question 31.2	question 42				
	⩽ 5	11-15	16-20	⩾ 26	total
screening team 2)	3	8	5	5	21
general practitioner 2)	13	29	22	16	80
each case	0	0	1	0	1
otherwise	0	1	0	0	1
total	16	38	28	21	103

2) Wilcoxon z = 0.28 not significant

question 31.3	question 42				
	⩽ 5	11-15	16-20	⩾ 26	total
screening team 3)	2	5	3	3	13
general practitioner 3)	14	33	25	18	90
each case	0	0	0	0	0
otherwise	0	0	0	0	0
total	16	38	28	21	103

3) Wilcoxon z = 0.10; not significant

ANNEX 45 *CHAPTER VI*

RELATION BETWEEN THE ANSWERS TO QUESTION 38 AND 31 OF THE GENERAL PRACTITIONERS QUESTIONNAIRE

question 38 : What is the total number of patients in your practice (National Health + private patients) ?

answer : < 2500

2500-3500

> 3500

Question 31: Who do you consider the right person to tell the results of a screening examination to the person examined ?

question 31.1: When no abnormalities have been found

31.2: In case of borderline abnormalities

31.3: In case of pathology

answer : screening team

general practitioner

to be decided independently for each case

otherwise, such as . . . . . .

question 31.1	question 38			
	< 2500	2500-3500	> 3500	total
screening team 1)	10	25	25	60
general practitioner 1)	13	16	11	40
each case	0	0	0	0
otherwise	0	3	0	3
total	23	44	36	103

1) Wilcoxon $z = 2.15$; $P_2 = 0.03$; significant

question 31.2	question 38			
	< 2500	2500-3500	> 3500	total
screening team 2)	3	7	11	21
general practitioner 2)	20	35	25	80
each case	0	1	0	1
otherwise	0	1	0	1
total	23	44	36	103

2) Wilcoxon $z = 1.89$; $P_2 = 0.06$ not significant

question 31.3	question 38			
	< 2500	2500-3500	> 3500	total
screening team 3)	2	4	7	13
general practitioner 3)	21	40	29	90
each case	0	0	0	0
otherwise	0	0	0	0
total	23	44	36	103

3) Wilcoxon $z = 1.49$; not significant

Curriculum vitae

The author was born in Rotterdam in 1947. He postgraduated in 1972 as a member of the first group of medical students at the new Medical Faculty in Rotterdam. Since 1972 he worked at the Occupational Health Service for the Port of Rotterdam. During his stay at this unit the material concerned in this study was collected and analysed.

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