DETECTION OF SUSCEPTIBILITY TO CORONARY DISEASE*

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It is appropriate to start by reviewing the rationale of mass detection for coronary-proneness. Coronary heart disease (CHD) today is a problem of epidemic proportions in the economically developed countries. In many countries, in fact, rates are still rising.[1-5] In the United States 600,000 deaths were recorded from this cause in 1965, about one third of all fatalities. Of these 600,000 deaths about 165,000 were in persons in the prime productive years of life: under 65. And for every fatal episode, at least two nonfatal disabling events occur. The average apparently healthy American male has a 20% risk of developing clinical CHD before 60.[6] The female is somewhat better off, but by no means immune.

One other aspect of this disease needs to be emphasized to help determine a strategy to stem this epidemic: a cardinal characteristic of CHD is that it often—i.e., in about 20% of first attacks—leads to sudden death; it produces a high over-all acute mortality rate (30 to 40%) in

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previously healthy middle-aged persons. The data of our group's long-term prospective epidemiologic study in the Chicago Peoples Gas Light and Coke Company are typical. Altogether, 82 men died from CHD in the first 10 years of follow-up of the entire study cohort: 1,465 men aged 40 to 59 in 1958. Of these 82 deaths (40.4% of all deaths), 39 were sudden deaths—precisely defined as death occurring within one hour of onset of symptoms. Thus 48.6% of all CHD deaths were sudden, occurring out-of-hospital, and too quickly to bring medical care to bear in most cases. Of the 39 sudden deaths, more than one half—22—were sudden and unexpected deaths, i.e., deaths with the very first illness, in men with no previous episode of clinical CHD.

Moreover, for middle-aged persons making a good recovery from acute first episodes of the so-called "good risk" type, the prognosis of dying in the next five years is about 20%, five times that of persons free of a previous history of CHD.[6] For persons with a history of two or more episodes, long-term prognosis is much worse.

A very simple lesson is to be derived from this information over and above the matter of the grim nature of coronary disease. The lesson is that any disease with such a natural history, with such a biology, cannot be mastered by medicine if the approach to therapy is solely or primarily directed at treatment for those who are already ill.

If medicine and society are to master this epidemic disease and if, appropriately, this is the goal set, even as previous goals have been set for mastering typhoid fever, polio, pellagra, scurvy, rickets, cholera, etc., then a clear strategy is needed.

The data on coronary heart disease compel the conclusion that for success the strategy must give main weight to *primary* prevention. It is in relation to the challenge of primary prevention that the whole rationale of screening must be understood.

Coronary Risk Factors and Their Detection

The need for primary prevention has been signaled by many aspects of research information gathered in the last hundred years, particularly since World War II. But the body of information that particularly supports the conclusion that there is a basis for primary prevention is the data about the coronary risk factors.

The coronary risk factors are those habits, traits, and abnormalities

TABLE I. STATUS IN 1958 WITH RESPECT TO THREE CORONARY RISK FACTORS* AND 10-YEAR MORTALITY FROM MYOCARDIAL INFARCTION AND SUDDEN DEATH: 1,329 MEN AGED 40 TO 59 IN 1958, FREE OF CHD AND FOLLOWED WITHOUT SYSTEMATIC INTERVENTION, 1958-1968—PEOPLES GAS LIGHT AND COKE COMPANY STUDY

Risk factor status, 1958	*No. of men*	*Ten-year mortality*			
		Myocardial infarction		*Sudden death*	
		No.	*Rate‡*	*No.*	*Rate*
None high	284	1	3.0	0	0.0
Any one only high	621	22	34.2	8	12.7
Any two or all three high	420	23	51.9	14	31.9
All	1,325†	46	33.4	22	16.2

*Risk factors: Serum cholesterol 250 mg./dl. >
Diastolic blood pressure 95 mm. Hg >
Smoking 10 > cigarettes per day

†No smoking data available for four of the 1,329 men

‡All rates are age-adjusted by five-year age groups to the U.S. male population, 1960. Rates are per 1,000.

t value: myocardial infarction = 5.62; sudden death = 4.04

which—when present—are associated with a sizable increase in risk of the disease in middle age or in young adulthood, in comparison with persons lacking those habits, traits, and abnormalities. The American Heart Association has defined a coronary-risk factor as a finding associated with at least a doubling of the risk. Thus it is not a matter of slight increases in risk, in the order of 10 or 20%, but rather in the order of 100 or 200% or more.

This is true for such coronary risk factors as hyperlipidemia, hypertension, and cigarette smoking today. These cardinal factors have been documented best and, while there are others, these three have the greatest impact. Studies have also shown that when multiple factors are present, their effects are additive.

Our most recent data from the Peoples Gas Company Study analyzed 10-year mortality rates in relation to the presence of these risk factors (Tables I and II). When any two or all three were present (hypercholesterolemia, hypertension, smoking), the mortality rate from heart attack was 17 times greater than for men without any of these three factors (51.9 per 1,000 versus 3.0 per 1,000). Those with any one of the three present had a risk 11 times that of the lowest-risk group (34.2 versus 3.0).

Another noteworthy finding is that almost one third of the men were in the highest-risk group. A critically important part of the

TABLE II. STATUS IN 1958 FOR THREE CORONARY-RISK FACTORS* AND 10-YEAR MORTALITY FROM ALL CAUSES AND ALL CARDIOVASCULAR-RENAL DISEASES: 1,329 MEN AGED 40 TO 59 IN 1958, FREE OF CHD AND FOLLOWED WITHOUT SYSTEMATIC INTERVENTION, 1958-1968—PEOPLES GAS LIGHT AND COKE COMPANY STUDY

Risk factor status, 1958	*No. of men*	*Ten-year mortality*			
		All causes		*All cardiovascular-renal diseases*	
		No.	*Rate‡*	*No.*	*Rate*
None high	284	13	42.6	4	11.9
Any one only high	621	71	106.6	39	57.9
Any two or all three high	420	78	169.7	38	84.9
All	1,325†	162	113.1	81	56.6

*Risk factors: Serum cholesterol 250 mg./dl. >
Diastolic blood pressure 95 mm. Hg >
Smoking 10 > cigarettes per day

†No smoking data available for four of the 1,329 men

‡All rates are age-adjusted by five-year age groups to the U.S. male population, 1960. Rates are per 1,000.

t value: all causes = 5.87; all CVR = 5.76

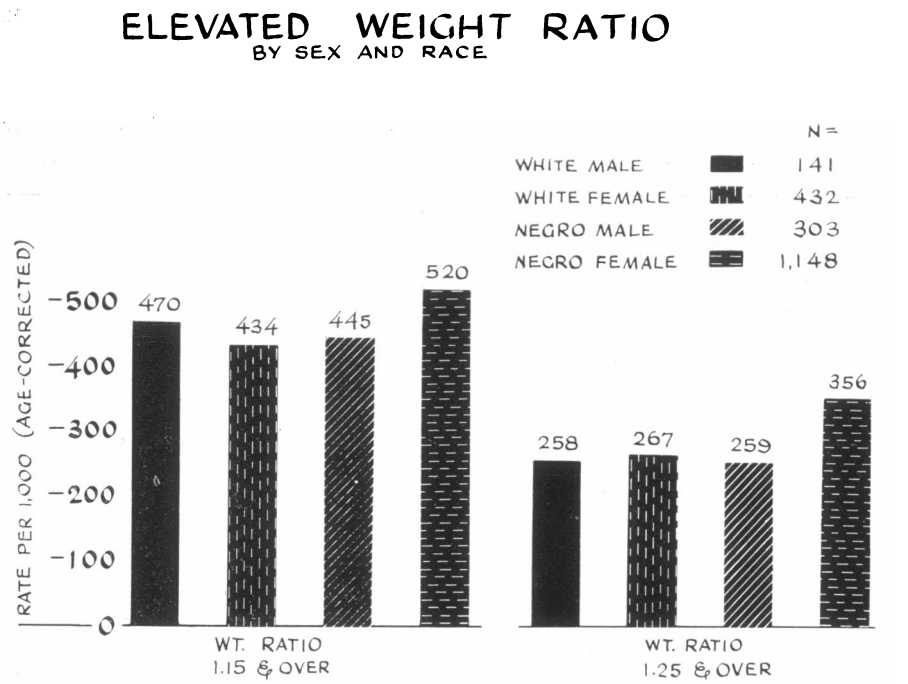
strategy comes from the fact that this third of the middle-aged population with such potentially lethal characteristics are not at all difficult to locate and identify—an indispensible first step in any program of primary prevention.

DETECTION PROGRAMS

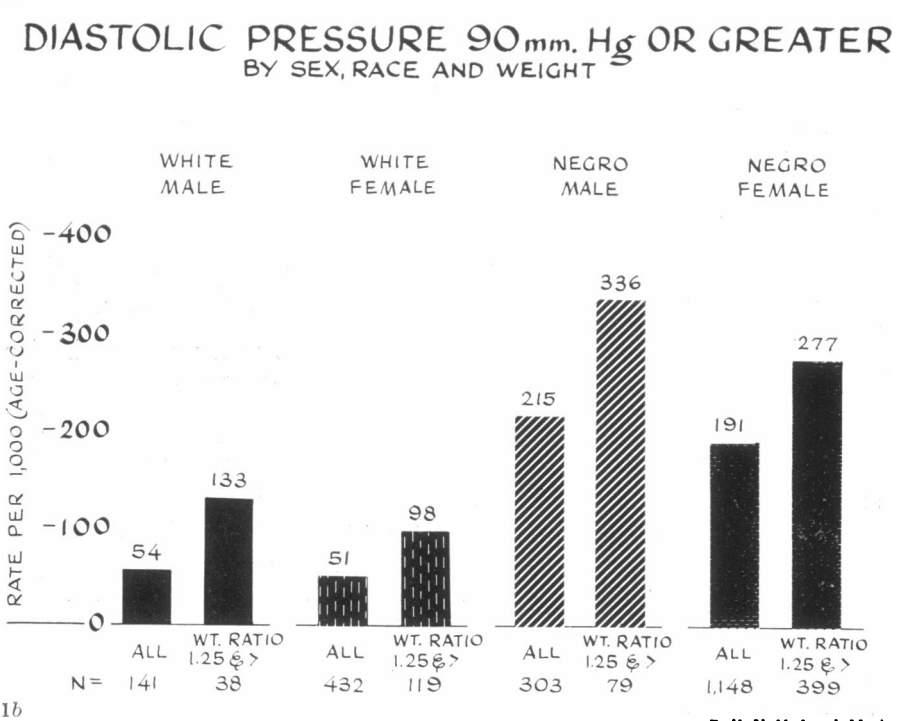
A program for detection of these risk factors has existed in Chicago since 1961, when a team including physicians, nurses, and interviewers initiated a pilot effort in low-income communities. Over the years procedures were simplified, and nonphysician personnel were trained to carry out a series of tests that lend themselves to "mass-production" for the detection of the most coronary-prone among those tested.

Figures 1*a* through 1*f* illustrate the findings for the more than 2,000 screened in 1966. The high yield is evident. As many as one third of the Negro men tested and over one quarter of the Negro women had elevated diastolic blood pressures. Probably closely related is the high prevalence of obesity among all sex-race groups; this was most marked among Negro women. Between 17 and 20% had elevated plasma-glucose levels after oral glucose load, with 6 to 10% classified as abnormal. Marked hypercholesterolemia was found in 9 to 14% of those tested. Fully 30% of Negroes and 20% of whites had abnormal electrocardiograms.

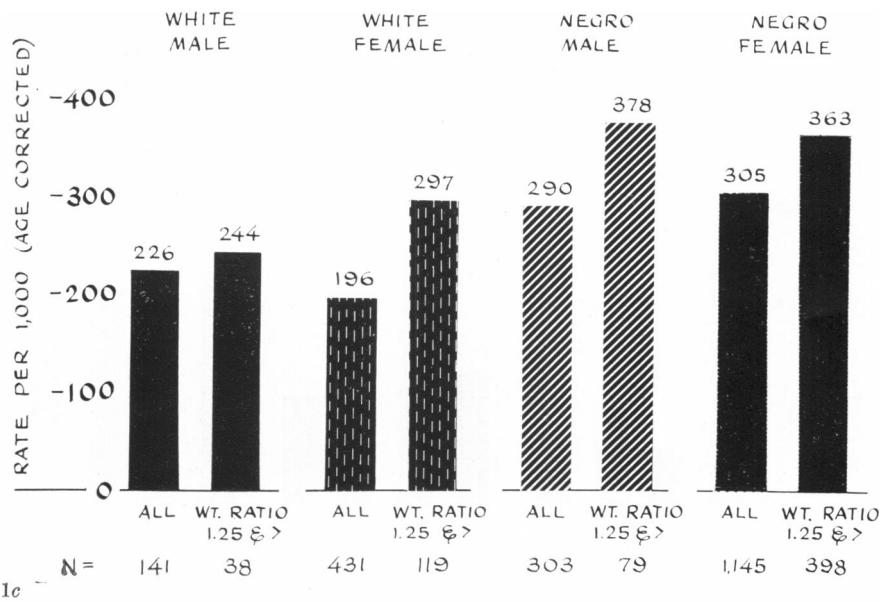
Figs. 1*a* through 1*f*. Detection of cardiovascular abnormalities and risk factors in persons aged 30 to 59 who resided in low-income communities, Chicago, 1966.



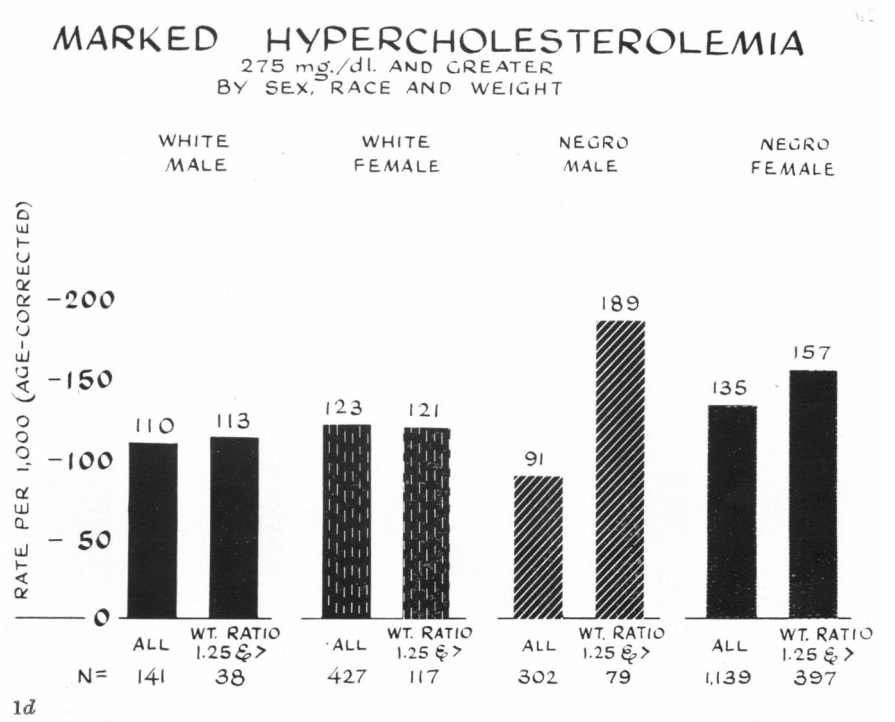
1*a*



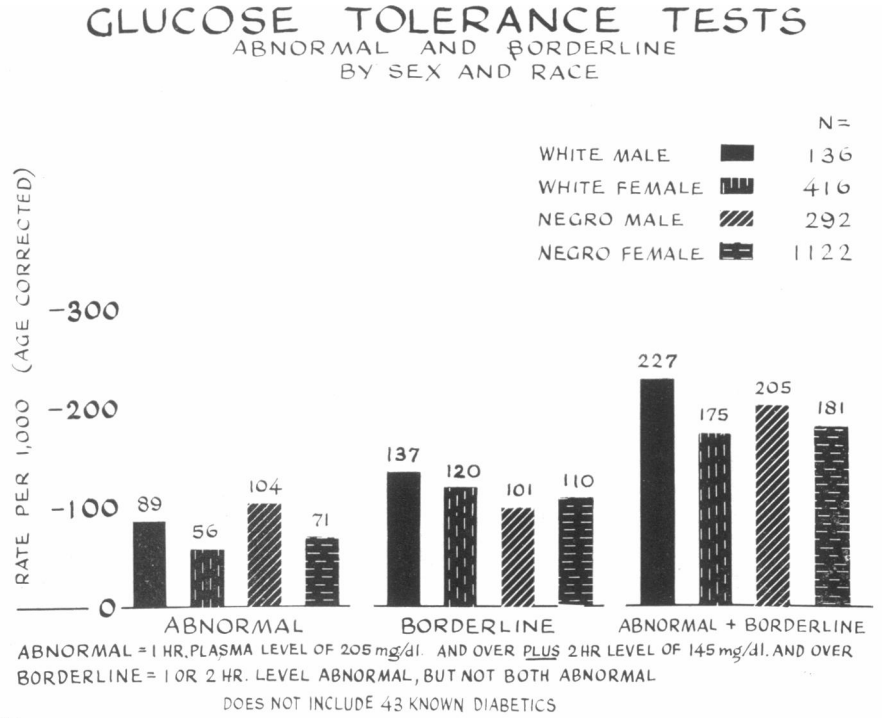
1*b*


ALL ECG ABNORMALITIES
BY SEX RACE AND WEIGHT
WHITE MALE
WHITE FEMALE
NEGRO MALE
NEGRO FEMALE
RATE PER 1,000 (AGE CORRECTED)
400
300
200
100
0
226
244
196
297
290
378
305
363
ALL
WT. RATIO 1.25 & >
N= 141 38 431 119 303 79 1,145 398

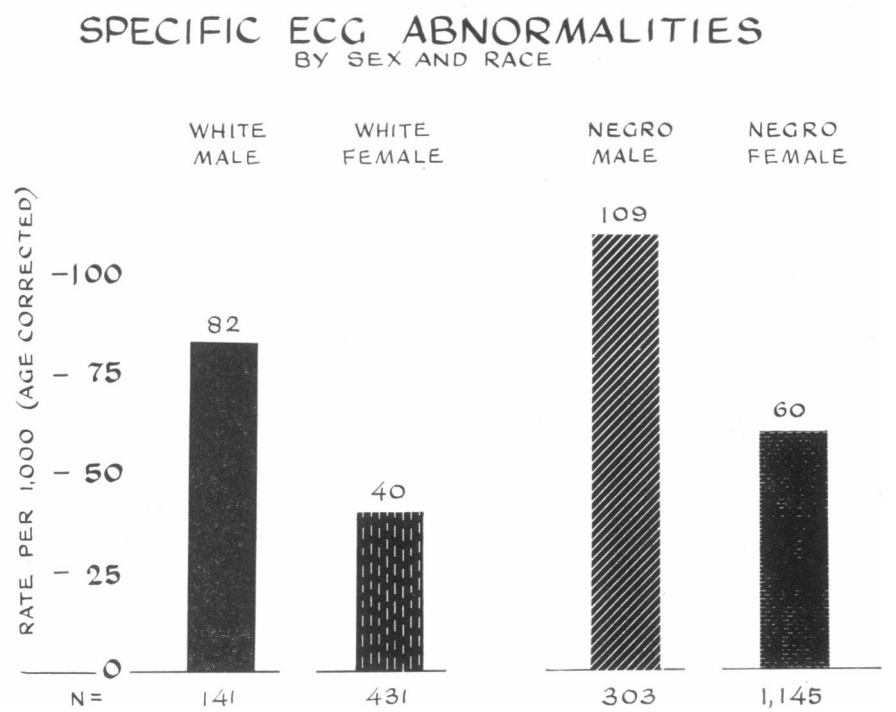
1c


MARKED HYPERCHOLESTEROLEMIA
275 mg./dl. AND GREATER
BY SEX, RACE AND WEIGHT
WHITE MALE
WHITE FEMALE
NEGRO MALE
NEGRO FEMALE
RATE PER 1,000 (AGE-CORRECTED)
200
150
100
50
0
110
113
123
121
91
189
135
157
ALL
WT. RATIO 1.25 & >
N= 141 38 427 117 302 79 1,139 397

1d


GLUCOSE TOLERANCE TESTS
ABNORMAL AND BORDERLINE
BY SEX AND RACE
N=
WHITE MALE 136
WHITE FEMALE 416
NEGRO MALE 292
NEGRO FEMALE 1122
RATE PER 1,000 (AGE CORRECTED)
300
200
100
0
89
56
104
71
137
120
101
110
227
175
205
181
ABNORMAL
BORDERLINE
ABNORMAL + BORDERLINE
ABNORMAL = 1 HR. PLASMA LEVEL OF 205 mg/dl. AND OVER PLUS 2 HR LEVEL OF 145 mg/dl. AND OVER
BORDERLINE = 1 OR 2 HR. LEVEL ABNORMAL, BUT NOT BOTH ABNORMAL
DOES NOT INCLUDE 43 KNOWN DIABETICS

1e


SPECIFIC ECG ABNORMALITIES
BY SEX AND RACE
WHITE MALE
WHITE FEMALE
NEGRO MALE
NEGRO FEMALE
RATE PER 1,000 (AGE CORRECTED)
100
75
50
25
0
82
40
109
60
N=
141
431
303
1,145

1f

Chicago Heart Association Detection Project in Industry

In 1967 the Chicago Heart Association initiated a program for detection of coronary-proneness in industrial organizations in the Chicago area. This, of course, required—and received—cooperation from labor, management, and other community groups. The project has the endorsement of the Chicago Association of Commerce and Industry, of the Central Labor Council of the AFL-CIO, as well as of voluntary official and professional health organizations and community groups. It is carried out on the basis of local initiative and organization, as on-the-job screening without loss of pay.

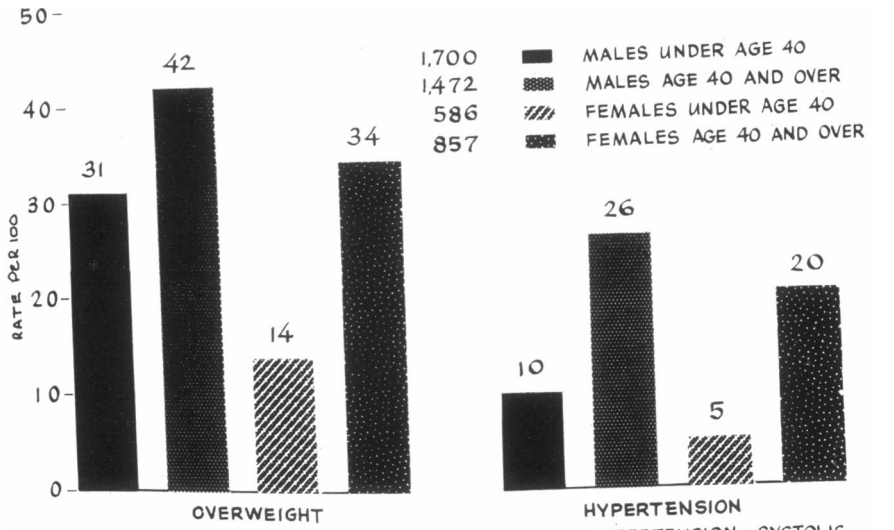
Procedures are kept to the minimum consistent with the goals of detecting the coronary-prone: a brief medical history (self-administered and reviewed by nurse or technician); administration of glucose load for the detection of diabetes; measurement of height and weight; determination of blood pressure; electrocardiogram; collection of blood for cholesterol and glucose (one hour after oral load). These procedures take 10 to 15 minutes for each person examined.

One special feature is the use of the ElectroCardioAnalyzer (ECA) —a special-purpose portable computer to obtain direct, immediate visual read-out to the technician of electrocardiographic findings.[7] With a positive reading of the ECA, the usual 12-lead ECG is taken. This has occurred in about 30% of cases and has reduced by 70% the number of ECG's to be read, mounted, and interpreted.

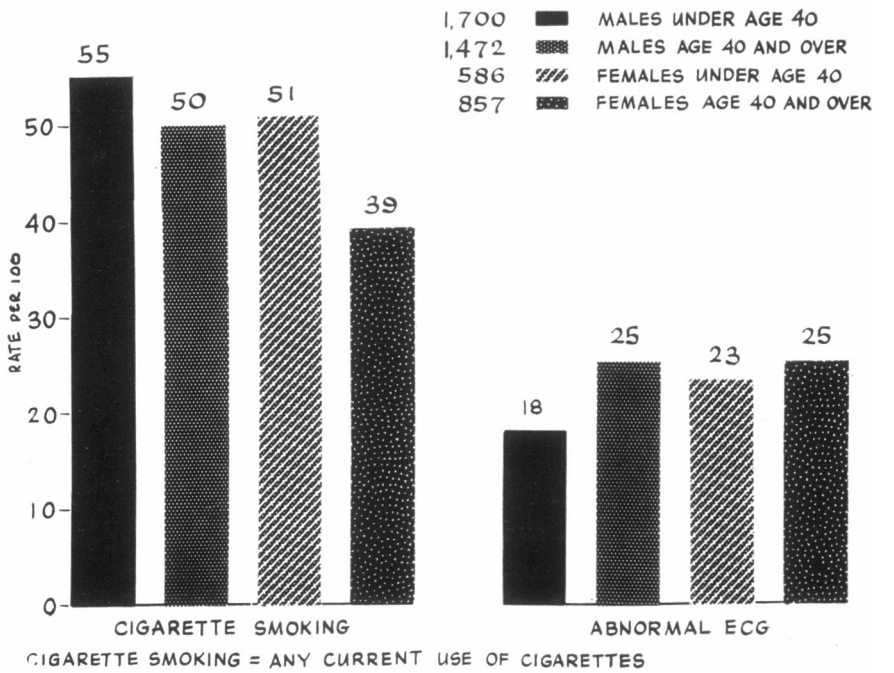
The detection unit consists of four persons (nurses and technicians) with the part-time service of a driver, who operates the station wagon that contains the needed equipment and supplies. This unit thus has great flexibility in movement and can readily bring its working tools to set up shop in factories, offices, housing projects, or other community centers. Of course the way must be paved in advance by public and professional education and by careful cooperative work with community agencies. It is highly gratifying that in the detection-in-industry program, with carefully planned, locally based publicity, educational and organizational effort, and assurance of data confidentiality, about 70% of plant workers have volunteered for screening.

Figures 2*a* through 2*d* summarize findings in the first 4,600 persons tested in this program. Again, the yield is high in detecting the coronary-prone. (The data presented here are for whites, since the number

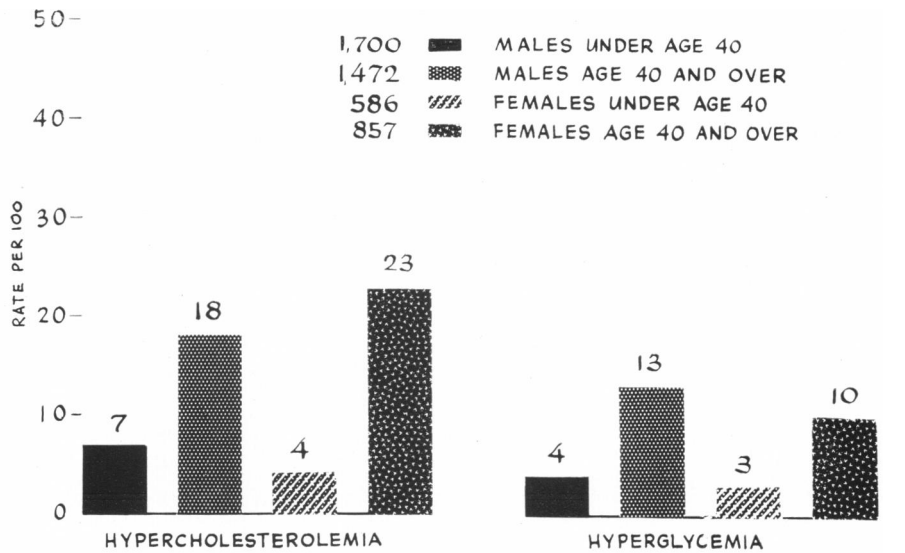
Figs. 2*a* through 2*d*. Detection of cardiovascular abnormalities and risk factors in industry: first 4,615 volunteers. Chicago Heart Association, Detection Program, 1967-1969.



2*a*

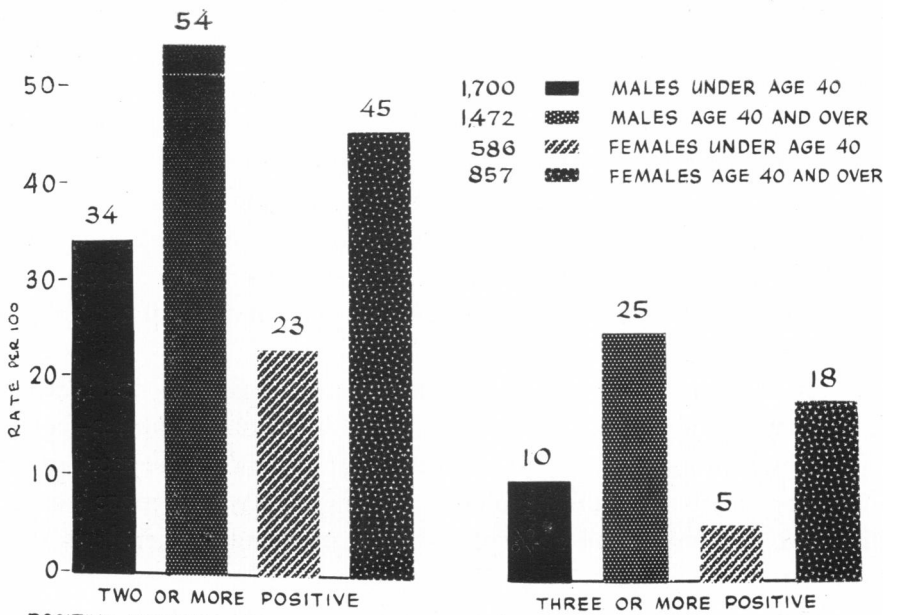


2*b*



HYPERCHOLESTEROLEMIA = 250 + mg./dl.; HYPERGLYCEMIA = PLASMA GLUCOSE 205 + mg./dl. 1 HOUR AFTER 50 gm. ORAL LOAD.

2c



POSITIVE FINDINGS ARE: HYPERTENSION (160 + SYSTOLIC, 95 + DIASTOLIC OR BOTH), HYPERCHOLESTEROLEMIA (250 + mg./dl.), HYPERGLYCEMIA (205 + mg./dl. PLASMA GLUCOSE 1 HOUR AFTER 50 gm. ORAL LOAD), OVERWEIGHT (25 % + ABOVE DESIRABLE WEIGHT), PRESENT CIGARETTE SMOKING, ABNORMAL ECG.

2d

TABLE III. BLOOD PRESSURE AND ECG ABNORMALITIES, WHITE MALES AGED 40 AND OVER: CHICAGO HEART ASSOCIATION DETECTION PROJECT IN INDUSTRY, 1967-1969

Blood pressure mm. Hg	*No. of men*	*Nonspecific T-wave abnormalities*		*All ECG abnormalities*	
		No.	*%*	*No.*	*%*
Systolic					
< 130	297	15	5.1	49	16.5
130 - 159	901	73	8.1	219	24.3
160 +	274	34	12.4	101	36.9
Diastolic					
< 80	265	14	5.3	49	18.5
80 - 94	929	78	8.4	222	23.9
95 +	278	30	10.8	98	35.3
All	1,472	122	8.3	369	25.1

of nonwhites in the industry program is thus far too few to yield meaningful information. The community data presented above describe findings among Negroes.)

Obesity is widely prevalent, with the exception of women under 40. High blood pressure is frequent, especially in those 40 and over. A considerable proportion show serum-cholesterol levels of 250 mg./dl. or greater—with 18% of the males and 23% of the females age 40 and over with this finding. Abnormal plasma glucose levels, after oral load, were near the 4% level for those under 40, and more than 12% in the older group. The *majority* of all but the older women were cigarette smokers, and more than one third of that group smoked. ECG's were abnormal for one quarter of those 40 and over, and for about 20% of those under 40.

Those with two or more, or with three or more such risk factors—combinations highly deleterious for long-term coronary health—constitute a high proportion of those screened. Fully half of the men 40 and over and nearly half of the older women have two or more positive findings, and more than 20% of the older men and women have three or more positive.

Again, as in the community detection program, the coronary risk factors are widely prevalent in the middle-aged population. If our first effort in primary prevention is to find the coronary-prone, there are millions in this country waiting to be found!

TABLE IV. RISK FACTORS AND ECG ABNORMALITIES, NORMOTENSIVE WHITE MALES AGED 40 AND OVER: CHICAGO HEART ASSOCIATION DETECTION PROJECT IN INDUSTRY, 1967-1969

Risk factor	*No. of men*	*Nonspecific T-wave abnormalities*		*All ECG abnormalities*	
		No.	*%*	*No.*	*%*
Serum Cholesterol					
< 250	639	35	5.5	112	17.5
250 +	128	9	7.0	30	23.4
Plasma Glucose					
< 205	715	42	5.9	127	17.8
205 +	52	2	3.8	15	28.8
Cigarette Smoking					
Never	175	10	5.7	27	15.4
Past	214	7	3.3	42	19.6
Present	378	27	7.1	73	19.3
No. of Risk Factors*					
None	304	13	4.3	48	15.8
One	357	22	6.2	66	18.5
Two or three	106	9	8.5	28	26.4
All	767	44	5.7	142	18.5

*Hypercholesterolemia, hyperglycemia, and current cigarette smoking

VALUE FOR EPIDEMIOLOGIC RESEARCH OF DATA FROM MASS DETECTION PROGRAMS

With a 70% response rate from the employed populations sampled, and with thousands surveyed over a relatively short period of time, mass detection programs serve an additional useful purpose, as a simple by-product, with little additional cost: their findings become a rich source of data for research analysis. Our group has made a preliminary examination of two research questions by using the data on the first 4,615 whites from the Chicago Heart Association project. The first is the relation between risk-factor status and resting ECG findings. Tables III and IV present a brief summary of the initial results for white males 40 and over. Table III shows, as expected, the higher prevalence of abnormal ECG's when hypertension is present. To remove this as a confounding variable in examining relations between other risk factors and ECG, Table IV shows normotensives only. The data indicate that prevalence of ECG abnormalities is higher in normotensive middle-

TABLE V. CORRELATIONS AMONG RISK FACTORS, 3,205 WHITE MALES: CHA DETECTION PROJECT IN INDUSTRY, 1967-1969

Risk factors	*Simple r*	*Partial r*
Age, plasma glucose	.36	.28
Age, serum cholesterol	.32	.25
Age, diastolic BP	.32	.21
Rel. wt., diastolic BP	.33	.27
Rel. wt., serum cholesterol	.22	.16
Plasma glucose, diastolic BP	.28	.15
Age, relative weight	.14	—.03
Serum chol., diastolic BP	.20	.05
Plasma glucose, serum chol.	.19	.05
Rel. wt., plasma glucose	.19	.09

TABLE VI. CORRELATIONS AMONG RISK FACTORS, 1,444 WHITE FEMALES: CHA DETECTION PROJECT IN INDUSTRY, 1967-1969

Risk factors	*Simple r*	*Partial r*
Age, plasma cholesterol	.51	.45
Age, plasma glucose	.37	.28
Age, diastolic BP	.35	.16
Age, relative weight	.31	.17
Relative weight, diastolic BP	.35	.27
Plasma glucose, diastolic BP	.25	.13
Plasma glucose, serum chol.	.17	—.03
Relative weight, serum chol.	.19	.02
Relative weight, plasma glucose	.17	.02

aged men when the specified risk factors are present, compared to the prevalence when they are absent, especially when multiple factors are present. More detailed analyses of these data, with age-adjustment by five-year age groups, are currently in progress, including corresponding tabulations for the three other age-sex groups.

Correlation coefficients, simple and partial, between several pairs of factors for all white males confirm well-known positive relations (e.g., age with blood pressure, plasma glucose, cholesterol), but they also indicate others of special import in any approach to assessing and improving risk status (Table V). This is the case with the high correlation

TABLE VII. PREVIOUSLY UNKNOWN HYPERTENSION, WHITES, BY AGE AND SEX: CHICAGO HEART ASSOCIATION DETECTION PROJECT IN INDUSTRY, 1967-1969

Age-sex group	*No. of persons*	*Hypertension*		
		All	*Previously undetected*	
			No.	*%*
Male < 40	1,700	173	130	75.1
Female < 40	586	30	23	76.7
Male 40 +	1,472	379	252	66.5
Female 40 +	857	175	97	55.4
All	4,615	757	502	66.3

of plasma glucose level and diastolic blood pressure. (The finding of lack of high correlation between relative weight and plasma-glucose level repeats results of several recent studies, and leaves open for further investigation a concept that has long been "gospel".)

The same patterns are illustrated in Table VI for the white women examined.

FINDINGS OF PREVIOUSLY UNKNOWN ABNORMALITIES AND THERAPY STATUS OF THOSE WITH KNOWN DISEASE

Of course screening is meaningful first if it detects abnormalities previously unknown to those examined. For the survey in industry, therefore, an analysis was made of previously unknown findings, plus the matter of status with regard to therapy for those previously aware of abnormalities. Of persons with screening findings indicative of hypertension or diabetes, 66.3 and 70.9% respectively were unaware that they harbored these traits; 92.5% of persons with abnormal ECG's gave no history of any prior positive cardiac findings (Tables VII to IX). Moreover, of individuals giving a history of hypertension confirmed by screening findings, 56.2% were receiving no drug treatment (Table X). The same general picture prevailed among previously known diabetics. Thus it is obvious that only a small minority of young and middle-aged adults with treatable CHD risk factors have been detected and brought under effective long-term preventive care.

Obviously detection is a means to an end, not an end in itself. The key objective is to encourage persons with positive findings to see their

TABLE VIII.—PREVIOUSLY UNKNOWN HYPERGLYCEMIA, WHITES, BY AGE AND SEX: CHICAGO HEART ASSOCIATION DETECTION PROJECT IN INDUSTRY, 1967-1969

Age-sex Group	*No. of persons*	*Hyperglycemia*		
		All	*Previously undetected*	
			No.	*%*
Male < 40	1,700	59	36	61.0
Female < 40	586	18	7	38.9
Male 40 +	1,472	186	135	72.6
Female 40 +	857	81	66	81.5
All	4,615	344	244	70.9

TABLE IX.—POSITIVE EGC's IN PERSONS WITHOUT HISTORY OF HEART DISEASE, WHITES, BY AGE AND SEX: CHICAGO HEART ASSOCIATION DETECTION PROJECT IN INDUSTRY, 1967-1969

Age-sex Group	*No. of persons*	*ECG Abnormalities*		
		All	*No Ht. dis. history*	
			No.	*%*
Male < 40	1,700	300	289	96.3
Female < 40	586	135	128	94.8
Male 40 +	1,472	369	329	89.2
Female 40 +	857	215	197	91.6
All	4,615	1,019	943	92.5

physicians for further diagnostic evaluation and possible long-term care for the control and management of risk factors in order to attempt to realize the possibility of postponing and preventing premature catastrophic clinical cardiovascular disease (particularly heart attacks). Therefore it becomes of great concern to determine whether this enhanced medical care is indeed the consequence of the screening effort. In the summer of 1968, as part of the evaluative work done along these lines, a special survey was organized that involved a sample of 213 persons referred to their physicians among the first approximately 1,200 persons screened from November 1967 to March 1968 in the C.H.A. Detection Project in Industry. Medical students interviewed the physicians named by 213 persons screened, who were all resurveyed by

TABLE X. THERAPEUTIC STATUS OF PERSONS WITH HISTORY OF HYPERTENSION, WHITES, BY AGE AND SEX: CHICAGO HEART ASSOCIATION DETECTION PROJECT IN INDUSTRY, 1967-1969

Age-sex group	*Hypertensives*	
	No. with history	*Per cent not on drug Rx*
Male < 40	133	78.9
Female < 40	27	81.5
Male 40 +	219	51.1
Female 40 +	142	38.0
All	521	56.2

TABLE XI. RESULT OF REFERRAL: CHA DETECTION PROJECT IN INDUSTRY, NOVEMBER 1967—MARCH 1968, SPECIAL SURVEY, SUMMER 1968

Group	*No. of persons*	*Per cent*	
		Of all referrals	*Of all referrals seen by M.D.*
All referrals	213	100.0	—
Referrals seen by M.D.	169	79.3	100.0
Treatment prescribed	100	46.9	59.2
Appointment pending	53	24.9	31.4

the same procedure and staff as previously. This repeat evaluation occurred on the average about six months after initial screening.

The great majority of those referred actually saw their physicians (79.3%), and in almost one half treatment was prescribed (Table XI). On the other hand, the interview with the physician indicated that a further appointment was pending for only about one half of those treated, which suggested that truly long-term care was not being effected to a degree that could be regarded as satisfactory. This is a matter that is being pursued further.

The problem of cigarette smokers—and the role of mass detection in aiding them to end this dangerous habit—is one of continuing concern. Table XII presents findings on cigarette smokers referred to their physicians. It should be understood that no one was referred for

TABLE XII. RESULTS OF REFERRAL—CIGARETTE SMOKERS: CHA DETECTION PROJECT IN INDUSTRY, NOVEMBER 1967—MARCH 1968, SPECIAL SURVEY, SUMMER 1968

Group	*No. of persons*	*Per cent*		
		Of all referred smokers	*Of referred smokers seen by M.D.*	*Of smokers advised to quit*
Referred cigarette smokers	82	100.0	—	—
Referred cigarette smokers seen by M.D.	66	80.5	—	—
Not advised to quit	46	56.1	69.7	—
Advised to quit	20	24.4	30.3	—
Did quit	4	4.9	6.1	20.0

Referrals were for risk factors in addition to smoking.

TABLE XIII. RESULTS OF REFERRAL: CHA DETECTION PROJECT IN INDUSTRY, NOVEMBER 1967—MARCH 1968, SPECIAL SURVEY, SUMMER 1968

Treatment prescribed by physicians	*No. of persons*	*Persons stating good adherence at six months*	
		No.	*%*
Medication	37	25	67.6
Diet	57	35	61.4
Exercise	24	12	50.0
Stop smoking	20	4	20.0

cigarette smoking per se. All of these 82 cigarette smokers were referred because one or more other risk factors were present. Of the 82 cigarette smokers referred, 66 did see their doctors. However, only 20 were advised to quit smoking. These findings strongly suggest that physicians in the Chicago area are not yet vigorous enough in counseling their patients—including patients with one or more other risk factors for premature heart attack—to quit smoking. Evidence is available from other sources indicating that this problem is not confined to Chicago. It would appear that doctors are not transmitting their own examples to their patients. (It is estimated that 100,000 physicians in the United States have quit smoking.) It would seem that doctors need to be encouraged in this regard. Of the 20 persons advised to quit, four ap-

parently did. At first glance this figure may seem disappointing. However, it may also be viewed positively as one step forward in the prolonged battle to change smoking habits.

In this regard it is noteworthy that of the 1,472 white males 40 and over, 434 (29.5%) had stopped smoking prior to being surveyed. Thus these data confirm information generally available for the nation as a whole about the trend to cessation of cigarette smoking. Any 5, 10, 15, or 20% addition to this trend contributed by the mass detection effort is another step forward, part of accelerating the positive long-term trend. This will be a long haul, and every achievement must be viewed in that light.

Table XIII gives some information about various types of treatment prescribed, and the statement of the person screened about his adherence six months after referral. This is of course a very sketchy picture. Nonetheless it suggests that a sizable proportion of persons are taking their doctors' advice seriously and are attempting to adhere to it long-term.

Limited information was collected in the special survey last summer concerning types of treatment prescribed by personal physicians for referred screened persons for whom a positive diagnosis was made. Treatment included medication (particularly for hypertension), dietary counsel (mainly for weight reduction), and advice to change sedentary living and smoking habits. Among patients given these recommendations adherence was reported—in response to a questionnaire—to be 67.6% to medication, 61.4% to dietary advice, 50.0% to exercise recommendation, and 20.0% (as already noted) to admonition to quit cigarettes.

Conclusion

These experiences clearly indicate that there is indeed a rationale for mass detection of high-risk persons. The risk factors are present at a high rate in the asymptomatic middle-aged population.

Moreover mass screening is a socially acceptable procedure at the present time in the community and in industry. It elicits widespread support, especially when the program is sponsored by organizations such as the Heart Association in cooperation with other voluntary agencies, health departments, medical societies, and other professional and community groups. As a consequence of the finding of abnormalities a significant proportion of persons will go to their doctors for diagnosis

and possible long-term care. But this does not mean that the problem being dealt with here is a simple or easy one.

The nature and scope of the problem is perhaps exemplified by the situation in our country with respect to hypertension—in a sense a relatively easy CHD risk factor to bring under control, since pharmacologic therapy is frequently indicated (in addition to nutritional-hygienic treatment). It may be roughly estimated—from the data of the National Health Survey—that there are about 20 million persons with hypertension in the United States at the present time. From several surveys it may be further approximated that about half of these are undetected. Further, of the known hypertensives only about half are under treatment. And of those being treated, only about one half had their blood pressure normalized—a reasonable therapeutic goal for ambulatory, "mild" hypertensives, who constitute the majority of cases. Thus about one eighth of the hypertensives in the United States are under reasonably decent therapy, to use the minimum criterion of normalization of blood pressure. If consideration is also given to need for treating concomitant hyperlipidemia, hyperglycemia, overweight, cigarette smoking—all factors adding further to risk of major cardiovascular complications for hypertensives—then the situation with respect to therapy for hypertensives is indeed even more unsatisfactory. Clearly the challenge is vast, the task ahead a big one. It will indeed take a well-planned, well-organized, well-financed, long-term social effort—local, state, and national, governmental and nongovernmental—with progressive expansion over years and decades until control is achieved.[6, 8]

A start needs to be made now in this large-scale, long-range social effort to bridge the current gap between patients and doctors in relation to the prevention of CHD and to develop more widespread and effective early detection and enhancement of sustained care. At the same time greater efforts are needed to encourage men and women to present themselves to their physicians for periodic examinations that should begin in young adulthood. For physicians the need is to incorporate tests for coronary risk factors (including the electrocardiogram) in their routine examinations and to enhance their mastery of the nutritional, hygienic, and pharmacologic methods for the long-term treatment and control of these abnormalities.

There is a long way to go, but the need, potential, and direction are clear.

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