

Characteristics of Men Most Likely to Respond To an Invitation to Be Screened

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Abstract: Some of the characteristics of men, with known risk factors, who were most likely to respond to an invitation to be screened in a national randomized clinical trial to prevent heart disease were determined in 18,872 men, 35-57 years of age, members of the Kaiser Foundation Health Plan of Oregon. Demographic characteristics and risk factor variables (blood pressure, blood cholesterol, and cigarette smoking levels) were abstracted from medical records.

The men were ranked high priority or low priority according to level of risk. All age-eligible men in the health plan received at least one invitation to be screened, with high-priority men receiving more in-

itations. Despite concentrated efforts to bring them in, less than one-half the high-priority men were screened. Participants were older and wealthier than non-participants, and more likely to have more dependents and to routinely use medical services. Whether or not a man received a medical care service within the preceding two years was a powerful discriminating variable in both the univariate and multivariate analyses reported. The findings suggest that health care programs serving a stable population group should give more consideration to screening in routine medical care. (*Am J Public Health* 69:1011-1015, 1979.)

Introduction

Health Maintenance Organizations (HMOs) are under pressure to develop outreach and screening programs to bring in enrollees who do not usually appear for routine medical care. Most attempts to do so have not been overly successful. Whether it is worth making special efforts to encourage nonusers to come in for medical care and how best to attain this objective remain to be studied.

In 1973, the Kaiser-Permanente Health Services Research Center, jointly with Northwest Permanente P.C., Physicians and Surgeons in Portland, Oregon, was chosen as one of 22 centers to participate in the National Heart, Lung, and Blood Institute's Multiple Risk Factor Intervention Trial (MRFIT).¹ Finding participants for the trial required the screening of healthy men, between the ages of 35 and 57 years, for their risk of heart disease. Risk was based on the possession of some combination of three factors known to be related to coronary heart disease: cigarette smoking, high diastolic blood pressure level, and high blood cholesterol level.

A three-stage screening process was intended to identify

in Portland at least 600 men (12,000 nationally) who were at high risk and who would be randomly assigned either to a special intervention group (study group) or to a usual care group (control group). At the first screening examination, each man was told that the purpose of the study was to learn how to prevent heart attacks and that the screening examination would provide information as to whether he was at higher than average risk of having a heart attack.

MRFIT Centers around the United States used various methods for obtaining their base population. Techniques ranged from concentrating on men in large industrial or governmental facilities to canvassing designated census tracts. The Center in Portland drew its screening population from the membership of the Kaiser Foundation Health Plan, which is representative of the community at large. When screening began in 1973 the membership numbered about 180,000, 15 per cent of the Portland, Oregon-Vancouver, Washington SMSA.²

Methods

Because every Kaiser-Permanente member has a centrally stored, unit medical record containing information on all contacts made with the medical care system, pertinent information on the risk factors and simple sociodemographic variables of many of the age-eligible men in the membership was already available before screening for the trial began. Therefore, a review of the medical records (charts) for smok-

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ing histories, blood pressure readings, and blood cholesterol results could identify a group that, when screened, would be expected to yield a high percentage of men eligible for randomization to the clinical trial.

Before the chart review was begun, a file of all age-eligible men in the health plan membership was checked against a computerized inpatient index of all hospital discharge diagnoses to identify and exclude men in the population at risk who had been hospitalized for diseases that would preclude their participation in the trial.

The analyses of this paper are based on a review of 18,872 medical records. To the extent available, the following data were abstracted from the charts: cigarette smoking behavior, the three most recent blood pressure readings, the three most recent cholesterol results, age, race, height and weight, antihypertensive drugs, any physical or mental problems that would preclude participation in the trial, and the date of receipt of the last medical care service.

Since the charts reviewed were those of essentially healthy men in the prime of life, many of the records contained information on only one or two of the variables, and some of that information was quite old. Thus, judgments about eligibility had to be somewhat subjective. The men whose charts were reviewed were ultimately perceived as being: 1) high priority, i.e., most likely to be eligible for the study if screened; 2) low priority, i.e., least likely to be eligible for study if screened; and 3) likely to be excluded from the study because of previous conditions.

The "high-priority" men were those whose charts showed that they possessed at least two of the three risk factors: a diastolic blood pressure equal to or greater than 90 mm Hg, a cholesterol reading equal to or greater than 240 mg/dl, and being a smoker. A man was also included in the high-priority group if his chart showed him to be at high risk on one factor only and contained no information on the other two risk factors, or if his chart contained no risk factor information.

These categories established the hierarchy of men who would be invited to be screened. Invitations were mailed just before screening started in February 1974. Those surveyed were told that the purpose of the study was to learn how to prevent heart attacks and that the screening examinations would provide information as to whether the individual was at higher than average risk of having a heart attack. Not all the men determined from the chart reviews to be in the highest risk category were invited first but were intermixed with men of supposedly lower risk.

Several weeks after mailing the first invitation to be screened, another letter was sent to every high-priority man not yet screened explaining the program and requesting him to come in for screening. Later, several telephone calls were made to all high-priority men still not responding. Before the initial screening period ended in September 1975, a final telephone contact was attempted to invite the remaining high-priority men who had not been screened.

Although all age-eligible male health plan members received a blanket invitation through the organization's newsletter, the present analyses concern only those men whose charts were reviewed.

TABLE 1—Pearsonian Correlation between Chart Review Values and MRFIT Screening Values for Men Screened

| | Most Recent | Highest | Mean of Three |
|----------------|-------------|---------|---------------|
| Cholesterol | .66 | .65 | .68 |
| Blood pressure | .38 | .44 | .47 |
| Smoking | .49 | — | — |

Results

Of the 18,872 charts reviewed, 12,646 men were categorized as being of high priority for screening, including men for whom there was no medical record information*. Of those men, 6,240 (49.3 per cent) accepted the invitation to be screened. In other words, less than one-half of the high-risk population was screened despite persistent efforts to obtain their participation. Of the 6,226 men categorized as low priority, either on the basis of known low risk factors or known exclusions, 494 men (7.9 per cent) ultimately volunteered for screening.

Table 1 presents Pearsonian correlations between the values found in the chart review and the values obtained in the MRFIT screening program for the most recent, the highest, and the mean of the three readings for cholesterol and blood pressure. In each case, the mean of three readings showed a slightly better correlation between chart value and screening values than did either the most recent or the highest reading, with a .68 correlation for blood cholesterol and a .47 correlation for diastolic blood pressure. The most recent smoking variable was the only reading used for that variable, and it is presented in Table 1. There was a .49 correlation between the number of cigarettes smoked as recorded in the medical chart and the number of cigarettes reported on the MRFIT screening examination.

Table 2 presents a comparison of the chart review and the screening data on mean blood pressure, mean blood cholesterol, and mean number of cigarettes smoked per day according to the individual's screening priority group and whether or not screened. The values for blood pressure, cholesterol, and smoking in both the medical charts and in the screening examination were much higher for the high-priority than for the low-priority men. A second finding of interest is that the blood cholesterol readings obtained during screening were considerably lower than those recorded in the charts.**

*At least one blood pressure reading was recorded in 75 per cent of the charts, and at least one blood cholesterol in 38 per cent; number of cigarettes smoked was recorded on 78 per cent of the charts. The number of men for whom no risk factor data were recorded was very small.

**At least three factors could account for these differences: the fact that different testing techniques were used, regression to the mean in the high-priority group (since one of the criteria used to establish high priority was a high cholesterol reading), and a secular change in the men's diet and, therefore, in their blood cholesterol readings.

TABLE 2—Chart Review and MRFIT Screening Values for Mean Diastolic Blood Pressure, Mean Cholesterol, and Mean Number of Cigarettes Smoked Daily for Screening Priority Status Groups

| | High Priority | | Low Priority | | Total |
|---------------------|--------------------------|--------------|--------------|--------------|--------------|
| | Screened | Not Screened | Screened | Not Screened | |
| Mean DBP | | | | | |
| Chart review | 86.5 (4361) | 86.5 (3584) | 79.5 (490) | 78.0 (5644) | 82.9 (14079) |
| Screening | 84.2 (6240) ^a | — — | 79.5 (494) | — — | 83.9 (6734) |
| Mean Chol (mg/dl) | | | | | |
| Chart review | 257 (2289) | 253 (1383) | 226 (291) | 225 (3161) | 241 (7124) |
| Screening | 221 (6240) ^b | — — | 211 (393) | — — | 220 (6734) |
| Mean No. Cigarettes | | | | | |
| Chart review | 8.4 (4645) | 8.2 (4652) | 8.4 (437) | 5.7 (4937) | 7.4 (14671) |
| Screening | 10.4 (6240) ^c | — — | 8.5 (494) | — — | 10.2 (6734) |

^aBlood pressure 85.2 for men with chart review data.
^bCholesterol value 227 for men with chart review data.
^cMean number of cigarettes smoked 11.0 for men with chart review data.

Table 3 shows the proportion of each of four subgroups of the total population (high and low priority, screened and unscreened) with eight selected characteristics. Within the high-priority group, the screened population, when compared to the non-screened, was more apt to have cholesterol levels equal to or greater than 240 mg/dl, to be smokers, to be older, to have dependents, and to have been seen for medical care within the last two years. Conversely the high-priority group that was not screened was more apt to have a diastolic blood pressure equal to or greater than 90 mm Hg, to be nonwhite, and to be at or less than the ideal weight. The chi square test showed all these findings to be statistically significant.

To summarize these data and to control for correlations, a multiple discriminant analysis was performed. Although the variables in the previous analyses were included, the blood pressure, cholesterol, smoking, and weight variables were recoded into categorical dummy variables, including the unknown cases. Actual codings are shown in the Appendix. Also included in this analysis was a set of geographic variables comparing the men residing in the core city, the rest of the city proper, and the two suburban areas where screening clinics were held with the remainder of the study

population. The multiple discriminant analysis confirmed the findings of the earlier analyses. The overall canonical correlation was only 0.26, although with the large N there was a highly significant chi square.

As can be seen from Table 4, whether or not a man received a medical care service within the last two years was the most powerful discriminating variable, both in the univariate and multiple analysis. The standardized coefficient for this variable was 0.80, whereas the next highest standardized coefficient (age) was 0.34. The men whose blood pressure, cholesterol, smoking status, and weight were unknown were less likely to have been screened.

The one finding that was reversed from the univariate analysis was that, with other things held constant, the known smokers were less likely to be screened than were either the known nonsmokers or those whose smoking status was unknown. This variable yielded a relatively large standardized discriminant function coefficient, even though the univariate F-ratio was significant (but rather small) and in the opposite direction.

Because the canonical correlation was relatively low for this analysis, the percentage of "group" cases correctly classified was slightly over 60 per cent. Obviously many oth-

TABLE 3—Percentage of Population Exhibiting Various Characteristics According to Screening and Priority Status Grouping

| Characteristic | High Priority | | Low Priority | |
|---------------------------|---------------------------------------|---|---------------------------------------|---|
| | Screened (N) % with Characteristic | Not Screened (N) % with Characteristic | Screened (N) % with Characteristic | Not Screened (N) % with Characteristic |
| Mean DBP 90 >/ | 34.6 (4361) | 37.6 (3584) | 14.3 (490) | 9.2 (5644) |
| Mean chol. 240 >/ | 65.9 (2289) | 59.7 (1385) | 34.7 (291) | 32.3 (3161) |
| Smoker | 34.1 (4774) | 32.2 (4794) | 34.9 (453) | 27.4 (5026) |
| Age 45-57 | 51.7 (6231) | 44.7 (6399) | 47.4 (492) | 49.3 (5723) |
| Race Nonwhite | 2.7 (5644) | 4.7 (4948) | 2.5 (481) | 3.6 (5582) |
| Last seen 2+ yrs. | 13.4 (6240) | 30.0 (6406) | 3.6 (494) | 13.4 (5732) |
| At or less than ideal wt. | 20.5 (3370) | 25.6 (2584) | 29.5 (440) | 33.2 (4901) |
| No dependents | 8.5 (6237) | 12.8 (6400) | 4.9 (493) | 8.0 (5725) |

TABLE 4—Findings from Discriminant Function Analysis Comparing High Priority Groups That Were and Were Not Screened

| | Univariate F-Ratio* | Standardized Discriminant Function Coefficient | Rank of Coefficient |
|--------------------------------|------------------------|---|------------------------|
| Blood pressure—high | 18.5 | -.18 | 7 |
| Blood pressure—unknown | 270.4 | -.17 | 9 |
| Cholesterol—high | 274.0 | .18 | 7 |
| Cholesterol—unknown | 359.4 | -.29 | 3 |
| Smoker | 6.9 | -.28 | 4 |
| Smoking status—unknown | 4.9 | -.14 | 12 |
| Weight—lower than ideal | 2.0 | -.18 | 7 |
| Weight—15% or more above ideal | 102.8 | -.09 | 16 |
| Weight—unknown | 242.1 | -.21 | 5 |
| Service within last 2 years | 536.8 | .80 | 1 |
| Residence—core area | 14.3 | -.13 | 13 |
| Residence—remainder urban | 6.9 | -.12 | 14.5 |
| Residence—suburban (B) | 20.9 | .15 | 10.5 |
| Residence—suburban (V) | 0.2 | .00 | 17 |
| Age | 79.7 | .34 | 2 |
| Number of dependents | 3.6 | .12 | 14.5 |
| Race | 16.3 | -.15 | 10.5 |

*Value greater than 3.8, for one and 12,620 degrees of freedom, indicates a significant difference between the two population means at the .05 level.

er factors besides those included in the discriminant function analysis would account for the likelihood of an individual being screened.

Discussion

The findings of this study are quite similar to those of previous studies that have attempted to determine the characteristics of persons most likely to participate in such screening campaigns as those to prevent heart disease,³ to detect breast cancer,⁴ and to detect cervical cancer.⁵ Generally, the persons most likely to participate in such screening programs are older, have more dependents, are higher in socioeconomic status, and are more likely to routinely use the medical care system.

Our study showed that, even though invited several times over a period of 18 months and by different techniques, including a telephone call, the high-priority men who did not routinely use the medical care system were reluctant to come in for screening. Of the 2,747 high-priority men who had not been in for any medical service within the previous two years, only 831 (30 per cent) were screened. In contrast, of the high-priority men who had used the system within the previous two years, 55 per cent were screened.

Also consistent with other findings, our study indicates that the persons most likely to participate in screening programs are older, have more dependents, are higher in socioeconomic status, and are more likely to routinely use medical care services.

The implications of these findings may have the most significance for organized medical care programs, such as HMOs under pressure to develop outreach and screening programs to bring in enrollees who do not usually appear for

routine care. The difficulty of getting high-risk non-utilizers to appear for screening, even when told that it would provide information about whether or not they were at high risk of having a heart attack, suggests that more consideration should be given to screening as a part of routine medical care rather than as special screening campaigns.

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Appendix***Coding of Variables for Discriminant Function Analysis***

| Variable | Coded |
|--------------------------|-------------------------------|
| Diastolic Blood pressure | |
| ≥ 90 | yes = 1 (22.6%) others = 0 |
| unknown | yes = 1 (37.1%) others = 0 |
| Cholesterol level | |
| ≥ 240 | yes = 1 (18.5%) others = 0 |
| unknown | yes = 1 (70.9%) others = 0 |
| Smoking | |
| smoker | yes = 1 (25.1%) others = 0 |
| unknown | yes = 1 (24.3%) others = 0 |
| Weight | |
| at or less than ideal | yes = 1 (10.7%) others = 0 |
| 15% above | yes = 1 (23.6%) others = 0 |
| unknown | yes = 1 (52.9%) others = 0 |
| Services in last 2 years | yes = 1 (78.3%) no = 0 |
| Residence | |
| core area | yes = 1 (7.5%) others = 0 |
| remainder urban | yes = 1 (25.8%) others = 0 |
| suburban area (B) | yes = 1 (4.5%) others = 0 |
| suburban area (V) | yes = 1 (5.1%) others = 0 |
| Age | continuous (mean = 44.3) |
| Number of dependents | continuous (mean = 2.9) |
| Race | nonwhite = 2 (3.6%) white = 1 |

NCHSR Extramural Associates Program

The National Center for Health Services Research (NCHSR) has recently announced an "Extramural Associates Program" as part of a continuing commitment to help ensure that ethnic and racial minorities have an equal opportunity to participate in and contribute to health services research.

Racial and ethnic minorities are under-represented in training programs for the health professions, due in part to unequal educational opportunities and to low health career expectations of large segments of the minority population. In addition to these consequences of past discrimination, there is a growing recognition of the acute need in many localities for more health professionals who belong to the minority communities.

To learn more about the Program activities, eligibility and candidate qualifications, the application process, and other Program information, contact: Coordinator, Extramural Associates Program, NCHSR/DHEW/PHS, 3700 East-West Highway, Room 7-50, Hyattsville, MD 20782, 301/436-6137. Ask for NCHSR/DHEW Pub. No. (PHS) 79-3253.