

## SELF-REPORTS PREDICTIVE OF MORTALITY FROM ISCHEMIC HEART DISEASE: A NINE-YEAR FOLLOW-UP OF THE HUMAN POPULATION LABORATORY COHORT

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**Abstract**—In order to assess the validity of self-reports of physical conditions, symptoms, and ailments, the nine-year mortality experience of a random population sample of 4590 adults, aged 35-94, in Alameda County, California, was examined. Consistently, increased risks of death from any cause and from ischemic heart disease were found for several self-reports. Multiple logistic analyses of deaths from ischemic heart disease showed that the best predictors for men were reports of "high blood pressure," "heart trouble," and "shortness of breath" and for women were "heart trouble," "swollen ankles," and "chest pain." The strength and consistency of the relationships between these self-reports and risk of death from all causes and from ischemic heart disease argues for the validity of such reports as measures of underlying disease state.

### INTRODUCTION

INDIVIDUALS readily provide reports of physical illness, symptoms, and ailments. However, the interpretation of such reports is clouded by a number of conceptual and empirical issues. Mechanic and others [1-5] have shown how such reports are influenced by the wide variety of factors known to influence illness behavior. Thus self-reports of symptoms, conditions, or ailments from this perspective are not good indicators of underlying disease state, representing instead the varied influences of a variety of socio-demographic, cognitive, and affective influences.

However, many studies have collected such self-reports, and it is important to understand to what extent they are associated with the presence of disease. In order to examine this issue of validity, investigators have utilized physical examinations, laboratory tests, physician reports, and medical records to examine the correlation between such self-reports and other, presumably more valid, data on the individual's health status [6-12]. These studies have found wide variation in the relationship between self-reports and other sources of information and have concluded that such reports cannot be assumed to reflect underlying disease state. The nature of these studies, however, creates certain interpretive problems. For example, studies which have examined the correlation between self-reports and conditions diagnosed by physicians can, by necessity, include only individuals who were examined. Since the path from symptom or complaint to the physician is influenced by many factors, this is a major limitation. Similarly, studies which examine medical records for corroborative information must take into account the extent to which symptoms or conditions are judged to be worthy of note in those records by the physician. Finally, given the variability in diagnosis and the probabilistic relationship between diagnosis of a condition or presence of risk factors and adverse health outcomes, there is some question as to the extent to which information from these sources represent appropriate outcomes by which to evaluate the validity of self-reports.

TABLE 1. RATE (PER 100) OF SELF-REPORTED CONDITIONS AND SYMPTOMS

	Men		Women	
	35-64 yr	≥ 65	35-64 yr	≥ 65
High blood pressure	9.3	22.5	13.9	32.8
Heart trouble	4.4	15.1	3.3	21.6
Frequent leg cramps	13.1	33.9	19.6	34.0
Pain in the heart or tightness or heaviness in chest	11.1	13.0	11.8	15.6
Trouble breathing or shortness of breath	12.3	17.3	15.4	19.6
Swollen ankles	4.8	13.9	20.0	27.9
Getting very tired in a short time	12.7	30.1	20.8	33.6

ination Study of 1960-62 (HES) [15]. Expected numbers of cases were based on the age and sex specific rates reported by the HES for "definite hypertension" (diastolic >95 and/or systolic >160 mmHg) and also for definitive or suspect coronary heart disease (history of ECG evidence of myocardial infarction and/or definite or suspect angina). The number of observed reports was compared to that based on the HES data. In all cases, there were lower levels of reporting in the current data. For high blood pressure, the rates were 67 and 76% of those expected for men and women, respectively. For "heart trouble," they were 74 and 96% of those expected for men and women, respectively.

Table 2 presents the approximate relative risk of death for all causes, ischemic heart disease (ICDA codes 410-414), and causes other than ischemic heart disease for those who reported affirmatively to each of the seven questions compared to those who responded negatively. Two broad age groupings, 35-64 and ≥65, were used to show the broad pattern of results. Relative risks were not calculated for strata where there were fewer than six deaths. Significance levels were calculated using the Mantel-Haenszel chi-square statistic [16]. The risk of death from any cause during the nine-year follow-up is significantly increased in the four age-sex groupings for those who reported "heart trouble," "chest pain," "shortness of breath," "swollen ankles," and "getting very tired in a short time." Reports of "high blood pressure" were associated with significantly increased risk of death in all categories except women over 65 years. The presence of "leg cramps" was associated with increased mortality only for men aged 35-65. Taken as a whole, this set of symptoms, conditions, and ailments is strongly associated with increased risk of death for any cause.

Examination of the relative risk of death from ischemic heart disease shows similar results. Respondents who reported "heart trouble," "chest pain," "shortness of breath," and "swollen ankles" were at significantly increased risk in all cases except women over 65 years. "Getting very tired in a short time" was significantly associated with increased risk of death for men of all ages and for women over 65 years.

Comparison of the increased risk of death from ischemic heart disease vs causes other than ischemic heart disease yields the expected pattern of results. For reports of "high blood pressure," "heart trouble," "chest pain," and "shortness of breath," there are greater risks of ischemic heart disease death than risk of death from causes other than ischemic heart disease. With the exception of women over 65, the increased relative risk of ischemic heart disease death vs other deaths is substantial. The differential association between report of condition, symptom, or ailment is small in the case of "swollen ankles," with only women 35-65 years showing a large excess in ischemic heart disease risk. For the report of "getting very tired in a short time," the results are inconsistent, and for "leg cramps," there is, in general, very little if any increased risk.

#### *Multivariate analysis*

In order to examine the independent association between each self-report and the risk of death from ischemic heart disease while controlling for the increased risk associated with other self-reports, a series of multiple logistic regression analyses was carried out. In the first such analyses, all variables were entered simultaneously, and their association with

ischemic heart disease mortality was assessed. The results from the analyses of this model are presented separately for men and women in Table 3. For men, reports of "high blood pressure," "heart trouble," "shortness of breath," and "swollen ankles" were all significantly associated with increased risk while controlling for the presence of other factors in the model. For women, only self-reports of "swollen ankles" were associated with significantly increased risk, although reports of "heart trouble" and "chest pain" approached significance. For both men and women, age was a significant predictor of risk as would be expected.

A series of multiple logistic analyses was carried out in order to control for the problems associated with multicollinearity. In these analyses, an attempt was made to find the best fitting main-effect model containing the least number of variables. Age (35-44, 45-54, 55-64,  $\geq 65$ ) was included in all models. Models were tested against each other as well as against the model containing all variables. As recommended by Kleinbaum *et al.* [17], the significance of the difference between two models was assessed by a comparison of the log likelihoods associated with each model. The results of such attempts are presented in Table 3, where the best fitting model is presented separately for men and women. For men, the model which contains age, "high blood pressure," "heart trouble," and "shortness of breath" predicts the risk of ischemic heart disease deaths as well as the full model and significantly better than any other combination of variables. For women, the best model involves age, "heart trouble," "swollen ankles," and "chest pain." The increased risk associated with positive reports of all three "self-reports" which were significant for men and women was calculated based on the addition of logistic coefficients. For men, those who reported "high blood pressure," "heart trouble," and "shortness of breath" were at approximately 14 times the risk of death over nine years from ischemic heart disease when compared to those who reported none of the three. Women who reported "heart trouble," "swollen ankles," and "chest pain" were at approximately 6.5 times the risk of those who reported none of the three.

In order to summarize the impact of all three self-reports, an index was constructed, separately for men and women, which reflected the total number of self-reports endorsed by an individual, using only those identified in the best fitting logistic model. For men, 33.3% of those who endorsed two or three died from ischemic heart disease during the nine-year follow-up, while only 6.6% of those who endorsed zero to one died. For women, the respective percentages were 18.5% for those who endorsed two to three and 4.0% for those who indicated zero to one.

## DISCUSSION

The analyses presented here demonstrate that self-reports of some conditions, symptoms, and ailments presumed to be relevant to coronary heart disease are significant predictors of death from ischemic heart disease. Thus, although such reports may be subject to a variety of biasing factors, they do have validity as indicators of coronary disease status. The strength of the associations with risk of death in the nine-year follow-up period suggests that, in studies where more direct measures of coronary disease are not available, self-reports of these conditions, symptoms, and ailments can be useful as proxy indicators of underlying disease state. Although it is likely that these self-reports are not simply related to any specific disease process, the levels of risk associated with report of more than one of these conditions, symptoms, or ailments suggest that selection of a group reporting two or three of these could be used to successfully classify a high proportion of those likely to have one form or another of ischemic heart disease at baseline or to statistically control for ischemic heart disease at baseline. Other evidence suggests that, in some situations, an index of these self-reports may be used as an outcome measure [18].

In a separate study conducted by the Human Population Laboratory in 1974, based on a sample of Alameda County representative of the population of the County in 1974 ( $N = 3118$ ), we were able to examine indirectly one of the sources of such self-reports. In this study, respondents were asked similar questions as were those in the 1965 cohort and,

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