

MARITAL STATUS AND RISK FACTORS FOR CORONARY HEART DISEASE

THE UNITED STATES HEALTH EXAMINATION SURVEY OF ADULTS

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Death rates from coronary heart disease (CHD) for persons aged 25 years and over are higher for the divorced, widowed, or the never-married than for persons who are currently married (Table I). This is true regardless of colour, and though there is some variation of this excess risk with age (e.g., white never-married women aged 55-64 and 65-74 have almost the same rates as white married women) it is present to some extent at all ages above 25.

Is this mortality difference real, or can it be explained by systematic errors and misclassification in the registration system? Such errors could occur in the following ways:

(1) Selective census under-enumeration, compared with married persons, of the never-married, widowed, and divorced: To the extent that this occurs, the estimate of the non-married population will be falsely low, and thus the calculated mortality rate falsely high. Because they tend to be more

transient, non-married persons may indeed be under-enumerated. The magnitude of this error, although not known, is probably not very large. The variation in estimated completeness of enumeration by colour and sex in the 1960 census was as follows: white males 97.2%, white females 98.4%, non-white males 89.1%, non-white females 91.9% (Siegel, 1968). It is unlikely that the difference among marital status groups would be more than the largest colour-sex difference, and this would not be sufficient to account for more than a small part of the excess rate among the non-married.

(2) Discrepancies in reports of marital status between the census and matching death certificate: Compared with the 1960 census record of persons dying between May and August 1960, the corresponding death certificate overstated the number of non-married persons by 2.1% (National Center for Health Statistics, 1969). This tendency will

TABLE I

RATIO OF DEATH RATES OF SINGLE, WIDOWED, AND DIVORCED TO RATES OF MARRIED FOR CORONARY HEART DISEASE, BY AGE, COLOUR, AND SEX: UNITED STATES, 1959-61
(ICD CODES 420 AND 422, 7TH REVISION)

Colour and Age	Male			Female		
	Never-married	Widowed	Divorced	Never-married	Widowed	Divorced
White						
15-24	0.91	25.27*	3.91*	0.75	21.25*	2.25*
25-34	1.52	1.98*	2.83	3.17	5.17	2.28
35-44	1.47	1.84	2.47	2.08	2.34	2.14
45-54	1.39	1.66	2.16	1.33	1.69	1.60
55-64	1.28	1.55	1.92	1.03	1.48	1.30
65-74	1.37	1.45	1.67	1.05	1.35	1.20
75-84	1.35	1.39	1.56	1.26	1.35	1.32
85 and over	1.27	1.35	1.37	1.63	1.56	1.40
Non-white						
15-24	0.96	—	—	1.20	—	—
25-34	2.24	4.24*	2.64	1.61	2.37	1.26
35-44	2.04	2.61	2.42	1.83	2.42	1.35
45-54	1.77	2.65	2.32	1.39	2.15	1.40
55-64	1.33	2.24	1.91	1.15	2.08	1.39
65-74	1.46	1.83	1.79	1.40	1.87	1.39
75-84	1.55	1.59	1.49	1.39	1.56	1.33
85 and over	1.42	1.58	1.73	1.91	1.91	1.29

* Ratio based on less than 20 deaths
— No deaths

falsely raise the non-married mortality, but again by an insufficient amount to account for the married/non-married difference.

(3) Selective over-assignment of CHD as a cause of death in non-married persons: In specifying the cause of death on the death certificate, considerable weight is given to the previous medical history. Given a death of sudden or unknown duration and no medical history, the medical examiner may list acute myocardial infarction as the cause of death. As a medical history from relatives will be available somewhat more often for married persons than for non-married persons, the latter may on this basis have an artificially high death rate from CHD. A test of this hypothesis, one which would require (a) standardized methods of assignment of cause, and (b) a high necropsy percentage on deaths occurring in a defined population, has not yet been made, so the quantitative importance of this selective over-assignment of CHD as a cause of death in the non-married is uncertain.

Thus, although there are imperfections in the registration of deaths, it may be that only a part of the excess CHD mortality in non-married persons is attributable to them. In an attempt to explain the remaining excess mortality, this study has examined differences between married and non-married persons in terms of personal characteristics known to be associated with CHD ('risk factors').

METHOD

Data were obtained from the United States Health Examination Survey of adults 1960-62. The Survey examined 6,672 persons, who comprised a probability sample of the 18 to 79-year-old civilian, non-institutionalized population. Details of the Survey design have been presented elsewhere (National Center for Health Statistics, 1965).

Persons were classified into four marital status groups: married and living with spouse, widowed, divorced, and never-married. Three hundred and four persons who were separated from or currently not living with their spouse were deleted from the analysis.

Selected risk factors for CHD were assessed as follows:

(1) systolic and diastolic blood-pressure: With the subject seated and the arm supported at atrial level, the examining physician made three measurements (to the nearest 2 mmHg) over a 30-minute period. The average of the three has been used. Diastolic pressure was defined as that reading at which sound disappeared; in the few cases where the sound

never disappeared, the reading at which muffling occurred was chosen;

(2) serum cholesterol: A modified ferric chloride procedure was employed at a central laboratory. Details of the method of collection and transport, and of variation among primary sampling units, can be found elsewhere (National Center for Health Statistics, 1965, 1967);

(3) ponderal index, defined as a person's height divided by the cube root of his weight: Height and weight were measured with the subject stripped to the waist and without shoes but wearing paper slippers and a lightweight examining gown.

In the analysis no attempt was made to take account of the complex design of the Survey. Thus the values given in Table II should not be interpreted as estimates for the United States population, despite the fact that the examinees do constitute a national probability sample.

RESULTS AND DISCUSSION

Analysis was restricted to examinees 25 to 79 years of age. Within this range there was an association of age with the risk factors (generally, higher levels of risk factors at older ages) as well as with marital status (e.g., a greater proportion of widows at older ages). Therefore, in Table II the mean and standard error for each risk factor distribution, within each marital status group, have been adjusted to the age distribution of the total 25 to 79-year-old population of that sex.

Table II reveals no differences for any risk factor to explain satisfactorily the married/non-married CHD mortality difference. Neither the never-married nor widowed men differed significantly from the married for any risk factor; divorced men had cholesterol and blood pressure levels that were somewhat lower, i.e., in the wrong direction to account for their greater risk. Among the women, only the differences in ponderal index and diastolic blood pressure between married and never-married exceeded the 5% significance level. The difference in ponderal index is in the wrong direction to explain the lower mortality in married women, the never-married women having the higher value (i.e., they are leaner). Diastolic blood pressure was higher in never-married women, however, and blood pressure is a potent risk factor for CHD in women (Truett, Cornfield, and Kannel, 1967). Thus, if the observed difference is not merely due to sampling error, this diastolic blood pressure difference could provide a reasonable explanation for much of the married/never-married mortality difference among women. However, the diastolic blood

TABLE II

MEAN* AND STANDARD ERROR OF FOUR SELECTED CHD RISK FACTORS, PERSONS AGED 25-79, BY SEX AND MARITAL STATUS: UNITED STATES HEALTH EXAMINATION SURVEY, 1960-62

Sex and Marital Status	No. of Examinees	Serum Cholesterol (mg %)		Systolic Blood Pressure (mmHg)		Diastolic Blood Pressure (mmHg)		Ponderal Index	
		Mean	SE	Mean	SE	Mean	SE	Mean	SE
Male									
Married	2,232	219.2	1.1	133.1	0.4	80.8	0.3	12.36	0.01
Never-married	222	217.2	3.9	135.3	1.6	81.2	0.9	12.42	0.06
Widowed	76	204.1	17.5	132.0	6.5	84.4	3.5	12.19	0.25
Divorced	71	204.2	7.3	128.6	2.2	78.8	1.3	12.47	0.08
Female									
Married	2,210	219.4	1.3	131.5	0.5	79.6	0.3	12.04	0.02
Never-married	169	223.3	4.1	133.7	1.7	82.0	0.9	12.31	0.06
Widowed	381	218.5	5.6	131.2	1.5	79.8	0.7	12.02	0.09
Divorced	119	223.0	4.5	129.3	1.7	78.6	1.1	12.22	0.08

*Adjusted to age distribution of the 25 to 79-year-old population of each sex.

pressure levels of widowed or divorced women did not differ from those of married women, so yet another hypothesis would have to be advanced to account for their increased CHD mortality. Additionally, with so many comparisons being made within Table II, even if no real difference existed for risk factor levels among marital status groups, on the basis of chance one or two would be expected to show a difference. In short, a less equivocal interpretation of the diastolic blood pressure difference between married and never-married women will await the results of subsequent studies.

Since the data were summarized over the entire 25 to 79-year age range, could a significant relationship between a risk factor and marital status at certain ages only have been overlooked? To examine this possibility the non-married groups were combined, and their risk factor levels at ages 25-34, 35-44, 45-54, 55-64, and 65-79 were compared with those of married persons of the same age. The married/non-married difference did not vary significantly among the age groups for any risk factor except for serum cholesterol in women. Younger married women had lower values, while older women had higher values, than their non-married counterparts. The relevance of this finding is uncertain; the cholesterol/marital status/age association does not also hold true for men, and, with many comparisons being made, the possibility that an isolated significant one may be due to chance must be borne in mind. Analyses of other sets of data will be necessary to clarify this point.

SUMMARY

Coronary heart disease mortality among divorced, widowed, and never-married men and women is greater than among the married. This appears to be attributable only in small part to omissions and misclassification in the registration system, although the importance of selective over-assignment of coronary heart disease as a cause of death in the non-married has not been adequately assessed. Data from the United States Health Examination Survey of adults were analysed to determine if any association existed between marital status and several risk factors for coronary heart disease (serum cholesterol, systolic and diastolic blood pressure, ponderal index). There were no consistent differences in any of the risk factor levels between married and non-married men and women; the attribute(s) of non-married persons responsible for their excess coronary heart disease mortality remain(s) obscure.

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