Survival of healthy older people

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Anderson, F. and Cowan, N. R. (1976). *British Journal of Preventive and Social Medicine*, **30**, 231-232. **Survival of healthy older people.** The purpose of this study was to discover any relationships which might exist between measurable variables recorded when a healthy group of men and women, aged 70 years and over, were examined and their subsequent survival time. It was found that height, body weight, systolic and diastolic blood pressures, haemoglobin, hand grip power, cardiothoracic ratio, and pulse rate are of no predictive value in the estimation of survival time. Survival is not influenced by marital status or occupational class. For both sexes the degree of kyphosis and age are useful predictive criteria in respect of survival time. However, much research work requires to be done to explain why many people die at the time they do.

METHODS

From 1952 to 1960, 239 men and 184 women, aged between 70 and 89 years, who attended the Rutherglen Consultative Health Centre for Older People had a detailed medical examination and psychosocial assessment and were considered to be healthy. These people did not represent a random sample of the population as the Centre was an experiment designed to provide clinical facilities for the early detection of disease in the elderly, and intake was dependent on general practitioner referral. Deaths which subsequently occurred were noted in the Register of Deaths maintained by the Health Department and from information derived from general practitioners (Anderson and Cowan, 1955). By the early part of 1974 17 men and nine women could not be traced, while of the remaining 222 men and 175 women, four and five respectively were still alive. Those men and women found to be still alive are included in the data used for the statistical analysis.

Age is in completed years. Survival is the number of completed years between the time of examination and the time of death. Arterial blood pressure was estimated with the subjects lying at rest on an examination couch. The systolic blood pressure was taken as that point at which sounds were first heard and the diastolic blood pressure at the point where the sounds become suddenly muffled.

Height and body weight were measured, with the subjects wearing a minimum of clothing and no footwear, using a Steelyard platform type of weighing machine reading accurately to 85 g.

The cardiothoracic ratio was derived from the transverse diameters of the heart and chest measured to the nearest millimetre from *x*-ray films taken in the postero-anterior position at a distance of two metres as previously described (Cowan, 1959). When the diameters could not be measured accurately the *x*-ray films were excluded from the series.

The haemoglobin concentration was obtained using a Sahli haemoglobinometer.

The hand grip pressure was measured with a Meredith dynamometer.

The pulse rate was counted over a period of one minute with the subjects lying at rest on an examination couch.

Lateral *x*-ray chest films taken at a distance of two metres were used to measure the kyphotic angle. A straight line was drawn downwards through the mid-points of the anterior margins of the second and third thoracic vertebrae. Another straight line was drawn upwards through the mid-points of the anterior margins of the 12th and 11th thoracic vertebrae. These two lines always intersect, and the superior angle formed by the intersection of these lines is recorded as the kyphotic angle and is measured in degrees. When the kyphotic angle could not be measured accurately the *x*-ray films were excluded from this analysis.

RESULTS

Table I shows for men and women the means and standard deviations of the variables observed.

TABLE I
MEANS, AND STANDARD DEVIATIONS OF THE SEVERAL VARIABLES, BY SEX

Variables	Men		Women	
	Mean	Standard Deviation	Mean	Standard Deviation
Height (cm)	165·7	6·7	153·1	6·8
Body weight (kg)	62·7	8·9	59·6	12·3
Blood pressure				
systolic (mmHg)	167·1	22·4	182·2	25·9
diastolic (mmHg)	87·3	8·6	90·2	10·2
Haemoglobin (g)	13·7	1·2	13·4	1·2
Grip pressure—				
right hand (kg)	38·0	5·0	28·9	3·3
Cardiothoracic ratio	0·47	0·036	0·52	0·043
Pulse rate (minute)	72·3	8·7	76·4	7·8
Survival time				
(completed years)	6·7	4·0	8·0	4·8
Age (completed				
years)	76·6	4·6	76·6	4·6
Kyphotic angle				
(degrees)	49·8	11·9	54·9	12·1

Table II shows for men and women the correlation coefficients with survival time for each of the other variables measured and also the correlation coefficients of age with kyphotic angle. Only age and kyphotic angle are of predictive significance in respect of survival time.

TABLE II
CORRELATION COEFFICIENTS FOR MEN AND WOMEN IN RESPECT OF SURVIVAL TIME AND OTHER VARIABLES AND OF AGE AND KYPHOTIC ANGLE

Variables	Men		Women	
	No.	r	No.	r
Survival				
age	222	−0·4431	175	−0·4522
systolic blood				
pressure	222	−0·1096	175	−0·1423
diastolic blood				
pressure	222	−0·0452	175	−0·0494
body weight	222	−0·0169	175	+0·0366
cardiothoracic				
ratio	205	−0·1048	168	−0·1531
haemoglobin	222	+0·0186	175	+0·0567
hand grip				
pressure (right)	207	+0·0632	175	+0·1525
height	222	+0·0904	175	−0·0797
kyphotic angle	201	−0·3359	168	−0·4057
pulse rate	222	+0·1271	175	+0·1309
Age				
kyphotic angle	201	+0·2093	168	+0·1946

Marital status and occupational class were also examined and found to be irrelevant in the estimation of survival time.

The regression of survival time $(\hat{Y})$ on age (X_1) and kyphotic angle (X_2) is assumed to be of the form

$$\hat{Y} = a X_1 + b X_2 + c$$

where a, b, and c are constants determined by the method of least squares.

The data give regressions whose equations are:
Men:

$$\hat{Y} = + 36·80 - 0·34 X_1 - 0·08 X_2$$

Women:

$$\hat{Y} = + 45·12 - 0·39 X_1 - 0·13 X_2$$

where $\hat{Y}$ = survival time (completed years), X_1 = age (completed years), and X_2 = kyphotic angle (degrees).

The standard deviations of the observed values of survival time from the regressions given above are:

Men: $^{S}Y_{12} = 3·48$ Women: $^{S}Y_{12} = 4·00$

The coefficients of X_1 and X_2 are for men and women highly significantly different from zero ($P < 0·01$ for all coefficients).

DISCUSSION

The purpose of this paper is largely completed by the presentation of the results. However, it is of some surprise that so many variables which might have been expected to influence survival, such as blood pressure and body weight, seem to have no significant part to play in the time of death. This statement is, of course, only relevant to men and women aged 70 years and over and found to be healthy when examined. What happens in younger years is likely to be quite another matter. It may be that by the time age 70 years is attained there has been a selective weeding out of individuals for whom some of the non-significant variables at 70 years and over might have had a significantly lethal effect. Furthermore, when data in terms of deaths due to cardiovascular and cerebrovascular causes only were assessed the findings did not differ significantly from those presented for all causes of death and there is no need to consider survival in respect of cardiovascular and cerebrovascular deaths separately.

The findings may well reinforce the belief that in older years to lower the blood pressure merely because it seems to be elevated is an undesirable procedure.

REFERENCES

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