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Self-assessed health and mortality: could psychosocial factors explain the association?

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Background The single-item question of self-assessed health has consistently been reported to be associated with mortality, even after controlling for a wide range of health measurements and known risk factors for mortality. It has been suggested that this association is due to psychosocial factors which are both related to self-assessed health and to mortality. We tested this hypothesis.

Methods The study was carried out in a subsample (n = 5667) of the GLOBE-population, a prospective cohort study conducted in the southeastern part of the Netherlands. Data on self-assessed health, sociodemographic variables, various aspects of health status, behavioural risk factors, and a number of psychosocial factors (social support, psychosocial stressors, personality traits, and coping styles) were collected by postal survey and structured interview in 1991, and mortality data were collected between 1991 and 1998. Cox proportional hazards analyses were used to calculate the association between self-assessed health and mortality, before and after controlling for the psychosocial variables.

Results After controlling for sociodemographic variables, various aspects of health status, and behavioural risk factors, self-assessed health is still strongly associated with mortality in our dataset (Relative Risk [RR] of dying for 'poor' versus 'very good' self-assessed health = 3.98; 95% CI: 1.65–9.61). After controlling for the same set of confounders, many of the psychosocial variables are statistically significantly associated with a 'less-than-good' self-assessed health, particularly instrumental social support, long-lasting difficulties, neuroticism, and locus of control. However, only 'disclosure of emotions'—coping style has a statistically significant relationship with mortality. Adding the psychosocial variables to a model already containing self-assessed health does not attenuate the association between self-assessed health and mortality.

Conclusions We did not find indications that the association between self-assessed health and mortality is due to the psychosocial factors included in this analysis. It seems likely that the unexplained mortality effects of self-assessed health are due to the fact that self-assessed health is a very inclusive measure of health reflecting health aspects relevant to survival which are not covered by other health indicators.

Keywords Self-assessed health, mortality, psychosocial

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In the early 1980s, Mossey and Shapiro showed that elderly Canadians' self-assessments of health were better predictors of 7-year survival than their medical records, or self-reports of medical conditions.[1] Since then, studies in different countries have confirmed that self-assessed health is an important predictor of mortality in many populations, including adults in California,[2] Britain,[3] Lithuania, the Netherlands,[4] Finland,[5,6] and Sweden;[7] elderly people in Japan,[8] Australia,[9] and New Haven;[10] and different ethnic groups in the US.[11] Many of these studies controlled extensively for known determinants of mortality, including (other) subjective and objectives measures of health.

Although some studies have not been able to reproduce this finding, in a recent review Idler and Benyamini[12] concluded that 23 out of 27 studies consistently showed a significant effect of self-assessments of health on mortality. This review also summarized the explanations that have been offered for this intriguing finding, including the hypothesis that 'self-rated health reflects the presence or absence of resources than can attenuate decline in health'. According to this hypothesis self-assessed health may reflect 'interpersonal resources' (such as

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social networks) or 'intrapersonal resources' (such as lack of control) which influence survival.[12]

One possible interpretation of this hypothesis is that the association between self-assessed health and mortality is not due to a causal effect of health (or its perception) on mortality, but due to a common association of both self-assessed health and mortality with psychosocial factors at the interpersonal or intrapersonal level.

There is indeed an abundance of literature documenting the effects of psychosocial characteristics on either self-reported health, or mortality, or both.

Perhaps the strongest evidence is available for indicators of social integration such as 'social ties', 'social networks' and 'social support', which have been shown to be related to both self-reported measures of physical and mental health, and to mortality.[13–15]

Psychosocial stressors such as bereavement, 'life events' and 'daily hassles' have been found to be related to illness and mortality,[16–18] although the evidence has not convinced all researchers, particularly in the case of studies relating self-reported stress to self-reported health.[19]

Personality traits such as neuroticism and locus of control have also been found to be associated with self-reported health measures,[20–22] and there is some evidence that locus of control may also be related to mortality.[23]

Finally, certain coping styles have been found to be related to self-reported health measures, perhaps because of their stress-enhancing (in the case of e.g. 'avoidance' strategies) or stress-buffering effect (in the case of e.g. 'disclosure' strategies).[24–26] It is less clear whether coping is also related to mortality.

In this paper we will test the hypothesis that the association between self-assessed health and mortality can in part be attributed to confounding by psychosocial factors. Psychosocial factors included in the study are social support, psychosocial stressors, selected personality traits, and coping styles.

Data and Methods

Study population

Our study population consists of participants of the GLOBE-study, a prospective cohort study designed to explain socio-demographic health inequalities in the Netherlands. The objectives and study design have been described in more detail elsewhere.[27] At baseline in 1991, participants were an aselect sample of non-institutionalized men and women with Dutch nationality, 15–74 years of age, living in the city of Eindhoven and surrounding municipalities. The study started with a postal questionnaire with a response rate of 70% (n = 18 967). From the respondents to this baseline survey two subsamples were drawn, one random sample and one in which people with one of four prevalent chronic conditions (chronic obstructive pulmonary disease[COPD]/asthma, cardiovascular disease, diabetes mellitus, low back pain) were overrepresented. The latter subsample was recruited in order to increase opportunities for studying determinants of the development of health problems over time. In the same year, both subsamples were approached for an additional structured interview (response rate of 75%, n = 5667), among whom n = 1945 had one or more of the four chronic conditions. This study sample was 50% male; 20% were aged 15–34, 37% 35–54, and 43% 55–74.

Data collection

Self-assessed health was asked in the baseline postal questionnaire through a single question: 'How is your health in general? Very Good, Good, Fair, Sometimes Good and Sometimes Poor, or Poor?' The category of 'Very Good' self-assessed health was used as the reference category in the analyses.

Mortality was measured in an administrative follow-up procedure in which the population registers of the municipalities of residence of the study participants were reviewed regularly to update vital status and address information. Assessment of vital status is virtually complete, and we used data up to (and including) 1998 for the analyses reported in this paper.

Table 1 presents the distribution of the study population by self-assessed health at baseline and by survival status in 1998.

We included three groups of confounders in the analyses: socio-demographic variables, various aspects of health status, and behavioural risk factors. The rationale was that these variables are independent determinants of both self-assessed health and mortality, without being intermediary between self-assessed health and mortality. All confounders were measured in the baseline postal questionnaire. The set of socio-demographic variables included age, gender, marital status, and level of education. The set of health status measures included self-reported chronic conditions (none versus one or more potentially lethal conditions [i.e. stroke, cancer, COPD/asthma, heart disease, diabetes mellitus, kidney disease]) and number of symptoms (<3 versus $\geqslant 3$ symptoms in a 13-item symptom inventory). The set of behavioural risk factors included smoking (four categories), alcohol consumption (four categories), physical exercise (four categories) and obesity (three categories).

We assessed the contribution to the self-assessed health-mortality relationship of four groups of psychosocial variables.

Social support was measured with a nine-item Dutch questionnaire asking for the emotional and instrumental support provided by the respondent's three most significant people.[28]

Psychosocial stressors included life events and long-lasting difficulties. Life events were measured by means of a checklist of nine negative events experienced in the preceding year, selected as events scoring high on Holmes and Rahe's social readjustment rating scale.[29] Long-lasting difficulties were measured with an 18 item-checklist covering financial problems, social deprivation, neighbourhood problems, health problems of significant others, and problems in relationships.[30]

We included two measures of personality: neuroticism and locus of control. Neuroticism was measured by means of the

Table 1 Study population

Self-assessed health	No. at baseline	(%)	Died during follow-up
Very good	709	(12)	18
Good	2766	(49)	107
Fair	1173	(21)	121
Sometimes poor	769	(14)	116
Poor	120	(2)	27
Missing	130	(2)	18
Total	5667	(100)	407

12-item Dutch version of the Eysenck Personality Questionnaire.[31] Locus of control was measured by means of the 12-item Dutch version of Rotter's locus of control scale.[32]

We measured seven different coping styles (confronting, avoiding, depression, social support seeking, palliation, disclosure of emotions, and optimism), using the 41-item Utrechtse Coping List.[33]

Each of these scales has been extensively validated in the Netherlands, and had good internal consistency. In the GLOBE-study: Cronbach's alpha values were 0.60 (emotional support), 0.67 (instrumental support), 0.81 (neuroticism), 0.84 (locus of control) and between 0.59 and 0.80 (various coping styles). In most cases, scores were divided into tertiles.

Analysis

The analysis was conducted in three phases. In Phase 1 we related mortality during follow-up to self-assessed health at baseline using Cox proportional hazards analysis. We controlled for three groups of confounders: socio-demographic variables, various aspects of health status, and behavioural risk factors. In Phase 2 we related psychosocial variables to self-assessed health (using logistic regression analysis) and to mortality (using Cox proportional hazards analysis), in order to assess which of the psychosocial variables are determinants of self-assessed health and mortality. In the final phase we added each of the psychosocial variables to the regression model used in Phase 1, in order to determine the contribution of the psychosocial variables to the explanation of the association between self-assessed health and mortality.

Variables were considered to be predictors of self-assessed health or mortality on the basis of an overall test of reduction in deviance (likelihood χ^2 test).

The study sample had an overrepresentation of four chronic diseases and so the analyses were performed with prior weights in order to achieve results representing the situation in the original study population. These weights were calculated from the number of people in the original study population that responders with and without chronic diseases represent (number represented is equal to number responding times reverse of sampling fraction times reverse of response fraction). Weights were normalized to obtain a power relative to the number of respondents.

Results

Table 2 shows the results of the analyses in Phase 1. In our study population self-assessed health is strongly associated with mortality. After controlling for age and gender, there is a sevenfold excess mortality risk among those who assessed their health at baseline as 'poor', as compared to those who assessed their health at baseline as 'very good'. Controlling for additional socio-demographic variables, for other aspects of health status, or for behavioural risk factors attenuates this excess mortality risk. However, even after controlling for all three groups of confounders together, there still is a fourfold excess mortality risk among those with poor health assessments.

Table 3 shows the results of the analyses in Phase 2. After controlling for age, gender and other socio-demographic variables, for various aspects of health status, and for behavioural risk factors, many of the psychosocial variables are still associated with self-assessed health: instrumental social support, long-lasting difficulties, neuroticism and locus of control all have statistically significant associations with self-assessed health ($P < 0.005$), while the association with life events is borderline statistically significant ($P < 0.10$). The strongest association is seen with long-lasting difficulties: the odds ratio of having less-than-good self-assessed health is 2.50 (95% CI: 1.96–3.18) for those in the highest quartile of long-lasting difficulties. None of the coping styles is related to self-assessed health. By way of illustration, the results for only two coping styles ('avoiding' and 'disclosure of emotions') are shown in Table 3.

The associations of these psychosocial variables with mortality are much weaker. After controlling for the same set of other variables, the only psychosocial variable that has a statistically significant ($P < 0.05$) association with mortality is the 'disclosure of emotions' coping style: those in the middle tertile for this variable have the lowest mortality risk. The association with life events is borderline statistically significant ($P < 0.10$; RR for one or more life events in the preceding year: 1.25 [95% CI: 0.96–1.63]).

Table 2 The association between self-assessed health and mortality, before and after controlling for socio-demographic variables, disease and symptom presence, and behavioural risk factors

	Relative risk of dying				
		Age, gender plus			
Self-assessed health	Only age, gender	Socio-demographic variables[a]	Disease symptoms[b]	Behavioural risk factors[c]	All (95% CI)
Very good	1.00	1.00	1.00	1.00	1.00
Good	1.33 ns	1.31 ns	1.25 ns	1.30 ns	1.18 ns (0.67–2.09)
Fair	3.09[d]	2.85[d]	2.49[d]	2.76[d]	2.13[d] (1.15–3.96)
Sometimes poor	4.13[d]	3.76[d]	3.07[d]	3.68[d]	2.58[d] (1.30–5.14)
Poor	7.12[d]	6.20[d]	5.12[d]	5.80[d]	3.98[d] (1.65–9.61)
Reduction in deviance for self-assessed health[e]	67.7231 $P < 0.001$	55.1249 $P < 0.001$	28.1118 $P < 0.001$	46.9582 $P < 0.001$	18.5372 $P < 0.01$

[a] Marital status, level of education.

[b] Chronic conditions, symptoms.

[c] Smoking, alcohol consumption, physical exercise, obesity.

[d] 95% confidence interval does not overlap 1.00.

[e] 5 degrees of freedom.

Table 3 The association between psychosocial factors and mortality and self-assessed health[a]

Psychosocial factors	Odds ratio for less-than-good self-assessed health (95% CI)	Relative risk of dying (95% CI)
Social support—emotional	RD[b]: n.s.	RD: n.s.
lowest tertile	1.07 (0.87–1.33)	1.10 (0.79–1.53)
middle tertile	0.92 (0.75–1.12)	1.04 (0.74–1.46)
highest tertile	ref.	ref.
Social support—instrumental	RD: $P < 0.005$	RD: n.s.
lowest tertile	1.02 (0.83–1.25)	1.04 (0.74–1.44)
middle tertile	0.74 (0.61–0.91)	1.09 (0.79–1.50)
highest tertile	ref.	ref.
Life events	RD: $P < 0.10$	RD: $P < 0.10$
none	ref.	ref.
one or more	1.18 (1.00–1.40)	1.25 (0.96–1.63)
Long-lasting difficulties	RD: $P < 0.001$	RD: n.s.
lowest quartile	ref.	ref.
second quartile	1.62 (1.27–2.07)	0.84 (0.60–1.18)
third quartile	2.25 (1.75–2.91)	0.84 (0.57–1.24)
highest quartile	2.50 (1.96–3.18)	0.96 (0.67–1.38)
Neuroticism	RD: $P < 0.001$	RD: n.s.
lowest tertile	ref.	ref.
middle tertile	1.05 (0.83–1.32)	0.87 (0.61–1.26)
highest tertile	1.66 (1.34–2.05)	1.22 (0.89–1.67)
Locus of control	RD: $P < 0.001$	RD: n.s.
first tertile	0.51 (0.41–0.64)	1.02 (0.69–1.50)
middle tertile	0.79 (0.64–0.96)	1.02 (0.75–1.38)
last tertile	ref.	ref.
Avoiding coping style	RD: $P = 0.10$	RD: n.s.
first tertile	ref.	ref.
second tertile	0.83 (0.68–1.01)	0.83 (0.60–1.15)
third tertile	1.01 (0.81–1.25)	1.08 (0.78–1.50)
Disclosure coping style	RD: n.s.	RD: $P < 0.05$
first tertile	1.09 (0.89–1.33)	1.12 (0.84–1.51)
second tertile	0.83 (0.67–1.02)	0.71 (0.49–1.04)
third tertile	ref.	ref.

[a] Analysis controlling for sociodemographic variables, various aspects of health status (excluding self-assessed health), and behavioural risk factors.

[b] Reduction in deviance (for the psychosocial variable when added to the model).

Not surprisingly then, adding the psychosocial variables to the model used in the last column of Table 2 does not attenuate the self-assessed health-mortality relationship. Only in the case of 'life events' and the 'disclosure of emotions' coping style do we see a slight decline of the relative risks of the self-assessed health-mortality relationship. The strongest effect is seen for 'disclosure of emotions', but even here the reduction in the relative risk of dying for 'poor' self-assessed health is marginal (from 3.98 to 3.87). Adding all psychosocial variables to the model has no effect on the relative risk of dying for 'poor' self-assessed health, and even slightly increases the relative risks for the other categories.

Discussion

In this study we found a strong association between self-assessed health and mortality, even after controlling for socio-demographic variables, various aspects of health status, and behavioural risk factors. We did not find indications, however, that psychosocial characteristics explain this association. In our study population, several psychosocial characteristics are strongly associated with self-assessed health, but they appear to be much less strongly associated with mortality. As a result, they cannot statistically account for the relationship between self-assessed health and mortality.

Before we discuss the possible implications of these results, it is necessary to briefly address a number of methodological issues. Our study had several limitations. First, we were unable to include objective measures of physical health in our analyses; such measures were not included in the baseline measurements of the GLOBE-study.[27] Thus, our control for aspects of physical health status may have been incomplete, and the 'independent' effect of self-assessed health on mortality may have been overestimated. In order to explore the possible impact of such overestimation on our overall conclusions, we repeated the analysis with a more extensive control for health status, using the six scales of

the Nottingham Health Profile.[34] While the Nottingham Health Profile is entirely based on self-reports, some of the scales (such as 'physical mobility') refer to more objective aspects of physical health status. Adding the Nottingham Health Profile to the statistical models did not, however, change our main conclusions. The association between self-assessed health and mortality, as presented in Table 2, remained statistically significant: the relative risk of dying for those with 'poor' self-assessed health changed from 3.98 (95% CI: 1.65–9.61) (Table 2) to 3.12 (95% CI: 1.28–7.62). Psychosocial factors, however, still could not explain the association: the maximum attenuation was again obtained upon inclusion of life events in the model, when the relative risk of dying changed from 3.12 (95% CI: 1.28–7.62) to 2.92 (95% CI: 1.19–7.16) (c.f. Table 4). It is therefore unlikely that our results on the negligible role of psychosocial factors would have been different with more extensive control for health status.

Second, we did not include all psychosocial factors which could possibly be involved in the self-assessed health/mortality relationship. Examples of psychosocial variables which we did not measure, and which are known to be related to self-reported health and/or mortality, are 'sense of coherence'[35,36] and 'hostility'.[37,38] We also did not measure all possible aspects of social ties (e.g. 'social networks') and psychosocial stress (e.g. 'daily hassles'). Some investigators have argued that positive/negative psychological states (depression, anxiety, hypochondriasis) are reflected in self-assessed health and may be related to mortality.[1,2,10] We did, however, include a wide range of factors which are likely to at least partly overlap, conceptually or empirically, with such unmeasured constructs. It is therefore unlikely (but of course not entirely impossible) that inclusion of more, or other, psychosocial variables would have changed our results substantially. We nevertheless invite other researchers to repeat the analysis reported in this paper using more and/or other psychosocial variables. Until all psychosocial factors that are potentially relevant have been investigated, it will be difficult to reach definitive conclusions about their role in explaining the association between self-assessed health and mortality.

Table 4 The effect of controlling for psychosocial factors on the association between self-assessed health and mortality

	Relative risk of dying (95% CI) by category of self-assessed health			
	Good	Fair	Sometimes poor	Poor
Base model[a]	1.18	2.13*	2.59*	3.98*
Controlling for:				
social support—emotional	1.18	2.12*	2.59*	3.93*
social support—instrumental	1.19	2.14*	2.60*	4.08*
life events	1.19	2.13*	2.62*	3.77*
long-lasting difficulties	1.19	2.21*	2.68*	4.10*
neuroticism	1.20	2.22*	2.66*	4.18*
locus of control	1.19	2.16*	2.63*	4.04*
avoiding coping	1.19	2.12*	2.59*	3.92*
disclosure coping	1.18	2.10*	2.56*	3.87*
All psychosocial variables	1.23	2.33*	2.86*	3.98*

[a] Including socio-demographic variables, various aspects of health status, and behavioural risk factors.

* $P < 0.05$.

Third, the follow-up period of our study was not very long (7 years). If the effects of psychosocial factors on self-assessed health have a considerably shorter lag-time than the effects on mortality, we could have missed a contribution of psychosocial variables to the explanation of the self-assessed health/mortality relationship.

It could be argued that we have underestimated the effect of psychosocial variables on self-assessed health and/or mortality by controlling extensively for socio-demographic variables, various aspects of physical health status, and behavioural risk factors. Earlier studies did not control extensively for these other factors, and may thus have found stronger associations between psychosocial variables and health indicators (see introduction of our paper for references). We controlled for these three groups of factors because we wanted to investigate the mysterious 'independent' effect of self-assessed health on mortality. Such control, however, is not necessary (and probably even incorrect) if one wants to investigate the effect of psychosocial factors on self-assessed health and mortality. One example is the control for behavioural risk factors: these are known to be important intermediaries in the effect of psychosocial variables on health (both self-assessed health and mortality).[13] We therefore repeated the second and third phase of the analysis with a model controlling for age and gender only (the first model used in Table 1). In this alternative analysis, we did indeed find stronger associations between psychosocial variables and both self-assessed health and mortality. For self-assessed health all associations now were statistically significant, whereas for mortality statistically significant relationships were found with life events, locus of control and coping styles (results not shown). This also removed the apparent contradiction between the analysis reported in this paper (showing no association between locus and control and mortality when health status and behavioural risk factors are controlled for) and that reported in a previous paper by our group (showing an association between locus of control and mortality when health status and behavioural risk factors are not controlled for).[23] The overall conclusion, however, remained the same: in this alternative analysis that omitted the control for health status and behavioural risk factors our set of psychosocial variables still did not account for the relationship between self-assessed health and mortality.

The main question 'what does explain the "independent effect of self-assessed health on mortality"?' therefore remains to be answered. In their review, Idler and Benyamini[12] summarize the explanations that have been offered:

'Self-rated health is a more inclusive and accurate measure of health status and health risk factors than the covariates used', for example because self-rated health captures symptoms of disease as yet undiagnosed;

'Self-rated health is a dynamic evaluation, judging trajectory and not only current level of health';

'Self-rated health influences behaviours that subsequently affect health status', for example because poor perceptions of health may lead to less engagement in preventive practices or self care;

'Self-rated health reflects the presence or absence of resources than can attenuate decline in health', for example because self-rated health reflects interpersonal or intrapersonal resources which influence survival.

In the present study we did not find evidence to support the latter explanation, and we therefore tend to think that one of the others is more likely to be true. Of the other explanations, the first is by far the most straightforward, although it may be difficult to accept by researchers who have done their utmost to cover all measurable aspects of physical health status. Could individuals in their self-assessment of health just be better informed than anyone else?

Idler and Benyamini suggest three additional sources of information on the individual: symptoms of disease as yet undiagnosed, complex judgements about the severity of current disease not covered by conventional health measurements, and family history of longevity.[12] Others have suggested that cardiophysiological experience[5] or physical fitness[6] may be involved. At a more general level, one might conclude that medical science apparently does not yet have a good 'map' of the entire health experience of individuals.

If this is true, then these gaps in medical knowledge could perhaps be filled by carefully investigating the reasons why individuals assess their health as they do. We may then be able to determine which of these reasons accounts for the strong relationship between self-assessed health and mortality. In this respect, qualitative studies could be particularly useful in order to discover which aspects respondents include in their health self-assessments.[39,40] These studies show that self-assessed health has several 'content domains', which do not all correspond to conventional dimensions of health, for example resistance to illness, functional capability, bodily or mental experience of health, physical and mental fitness, and health behaviour.[41] It is quite clear from these studies that self-assessed health is more than a simple aggregate of the presence or absence of symptoms, diseases, and disabilities, and we suspect that these other, evaluative and subjective components of self-assessed health could account for the 'independent' mortality effect. We therefore recommend further studies in which the components discovered in qualitative studies are linked directly to mortality.

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KEY MESSAGES

- The single-item question of self-assessed health has consistently been reported to be associated with mortality, even after controlling for a wide range of health measurements and known risk factors for mortality.
- This association cannot be explained by a number of psychosocial factors which may both be related to self-assessed health and to mortality: social support, psychosocial stressors, neuroticism, locus of control, and coping styles.
- The unexplained mortality effects of self-assessed health are probably due to the fact that self-assessed health is a very inclusive measure of health reflecting health aspects relevant to survival which are not covered by other health indicators.

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