PERGAMON

Social Science & Medicine 56 (2003) 1447–1452

SOCIAL SCIENCE & MEDICINE

www.elsevier.com/locate/socscimed

The effect of point of reference on the association between self-rated health and mortality

Kristiina Manderbacka[a,*], Ingemar Kåreholt[b,e], Pekka Martikainen[c,f], Olle Lundberg[d]

[a] National Research and Development Centre for Welfare and Health, Health Services Research, P.O. Box 220, FIN-00531 Helsinki, Finland

[b] Aging Research Centre, Karolinska Institutet/Stockholm University, Box 6401, SE 113 82 Stockholm, Sweden

[c] Population Research Unit, Department of Sociology, P.O. Box 18, 00014 University of Helsinki, Finland

[d] Centre for Health Equity Studies, Stockholm University/Karolinska Institutet, SE-106 91 Stockholm, Sweden

[e] Department of Social Work, Stockholm University, SE-10691 Stockholm, Sweden

[f] Department of Epidemiology & Public Health, University College London, 1-19 Torrington Place, London WC1E 6BT, UK

Abstract

This study examines the effect of point of reference on the predictive validity of self-rated health for mortality in a 5-year follow-up period. Two self-rated health measures are examined: an age group comparative question and a global question with no explicit point of reference. The baseline data (SweOld) is a nationally representative interview survey among Swedish people aged 77+ in 1992. Mortality for the 1992–1996 period was analysed using Cox proportional hazards regression models. Age-referential self-rated health was found to be a better predictor of elderly men's mortality both in non-adjusted models and in models adjusting for age and both self-rated health measures. In separate analyses, both measures were found to be equally strong predictors of women's mortality. When adding both measures into the model simultaneously, the age-referential question lost much of its predictive power. The findings suggest that self-rated health measures are not insensitive to differences in question wording.

Keywords: Self-rated health; Mortality; Health measurement; Sweden

Introduction

The observation that a simple, generic single-item question on overall health is a powerful predictor of subsequent mortality has aroused considerable research interest during the last three decades. Since the early studies suggesting an association between self-rated health and subsequent mortality (LaRue, Bank, Jarvik, & Hetland, 1979; Singer, Garfinkel, Cohen, & Srole, 1976), the association has been clearly demonstrated both among the general population (e.g. Idler & Angel, 1990; Kaplan & Camacho, 1983) and especially among elderly people (e.g. Idler & Kasl, 1991; Mossey & Shapiro, 1982; Benyamini & Idler, 1999; Idler & Benyamini, 1997). The results show considerable consistency irrespective of the time period, country and age group studied (Benyamini & Idler, 1999; Idler & Benyamini, 1997). In addition, the association between self-rated health and mortality has been observed despite considerable variation in the measurement of self-rated health both in terms of the number of response alternatives (commonly 3–5 response alternatives have been offered), and the wording of the question. In some studies, the question wording has included an explicit reference-group comparison, usually to age peers, whereas other studies use a global question mentioning no explicit point of reference. It has been proposed that

*Corresponding author. Tel.: +358-9-3967-2078; fax: +358 9 3967 2485.

E-mail address: kristiina.manderbacka@stakes.fi (K. Manderbacka).

0277-9536/03/$ - see front matter
PII: S0277-9536(02)00141-7

this consistency of association indicates that the concept of overall health is relatively insensitive to the semantic variations in the question posed, and that comparisons with age peers are implicit in the assessment, thus making an explicit point of reference redundant in the question wording (Idler & Benyamini, 1997).

However, the fact that different types of self-rated health indicators show an association with subsequent mortality is not entirely convincing proof of the redundancy of explicit points of reference. The process of rating one's health is likely to include two steps: (1) compiling all the relevant information on one's health and, (2) evaluating this information in terms of reference-group comparison or a standard. In addition to people of the respondent's own age, several other points of reference can be hypothesised to be used when assessing health. These include other groups of socially similar ones (e.g. women, see Fillenbaum, 1979), compared to the respondent's previous health (Manderbacka & Lundberg, 1996), as well as general expectations of health based on one's own life history and the family health history (Idler & Kasl, 1991).

Very few studies have simultaneously analysed the independent effects of global and age-referential self-rated health questions. Most of the studies have been unable to do so, since they have only used one self-rated health question. Three studies present results concerning more than one question (Appels, Bosma, Grabauskas, Gostautas, & Sturmans 1996; Deeg, van Zonneveld, van der Maas, & Habbema 1989; Kaplan & Camacho 1983). However, only one of them has analysed the questions both separately and simultaneously. Deeg and colleagues (1989) present results of the effect of a global question and a time referential question among Dutch elderly people. Both had a bivariate association with mortality, but in multivariate analysis only the time referential question remained associated with mortality.

There seem to be at least two possible reasons for the consistency of findings regarding different wordings of self-rated health question and mortality. First, it is possible that a global self-rated health question carries an implicit reference-group comparison of age peers, making explicit age comparisons redundant (cf. Idler & Benyamini, 1997). Second, it is possible that respondents consider other possible points of reference in addition to age group comparisons when answering the global self-rated health question, so that the questions capture partly different domains of health (cf. Manderbacka & Lundberg, 1996).

Empirically, the first possibility would mean that if a global self-rated health question and a question with an explicit age group comparison were entered to a regression model simultaneously, the effect would likely be split between the variables but the fit of the model would remain practically the same as that for each measure separately. If the second possibility were true, the associations between both self-rated health indicators and mortality would remain more or less unaltered when both are included in the model, i.e., both would remain strong predictors of mortality and the fit of the model should improve.

The aim of this study is to examine the effect of the point of reference on the predictive validity of self-rated health for mortality on a nationally representative sample of Swedish persons aged 77 or older. Two self-rated health measures are examined, a question with an explicit comparison with age peers and a general question with no explicit point of reference.

Data and methods

Study population

The baseline data used, the SweOld data, is an interview survey carried out among those aged 77 or older in Sweden in 1992 (Lundberg & Thorslund, 1996). The sample consisted of persons who had participated in earlier waves of a nationally representative panel survey on living conditions, but who had been dropped from this survey due to an upper age limit of 75 years. The inclusion criteria for the SweOld survey was that respondents should be born between February 15, 1892 and February 15, 1915, interviewed at least once in the Level of Living Surveys of 1968, 1974 and 1981, and be alive in January 1992. Of the 1936 eligible persons, 563 persons (aged 77–98 years) were still alive in the beginning of 1992. The interviews took place during spring 1992, and an extremely low non-response rate was achieved, only 5% (26 persons). In the following, the analyses are restricted to 432 persons (254 women and 178 men). Those interviewed by proxy interviews ($n = 68$) and those with missing values in any of the relevant variables were excluded from the analyses.

The interview data is complemented with register information, and information about date and cause of death that were retrieved through use of personal identity numbers from the Swedish National Cause of Death Registry for the period 1992–1996.

Variables used in the analyses

Answers from two questions concerning *self-rated health* are used as the main independent variables. They are the general question 'How do you describe your general state of health? Is it good, poor or something in between?' and the age-referential question 'How do you describe your general state of health compared to people of your own age?' with response alternatives better, worse and about the same. The correlation between the

global and the age-referential question is 0.25 for men and 0.33 for women and the proportions of persons on the diagonal are 61% for men and 63% for women suggesting that severe collinearity is not present. The outcome variable used is all-cause mortality. In total 167 persons (91 women and 76 men) died between the interview in February–April 1992 and the end of the follow-up period (December 31, 1996).

As can be seen in Table 1, both the response pattern and the mortality levels are skewed. Nevertheless, the mortality levels are very high as one would expect in a sample of people of such advanced age.

Methods

Cox proportional hazards regression models were used to analyse mortality for the 1992–1996 period (Blossfeld, Hamerle, & Mayer, 1989; Blossfeld & Rohwer, 1995; Clayton & Mills, 1993; Lancaster, 1990). The multiple regression method accounts for both the number and the timing of the deaths in the studied population. In Cox regressions no assumptions are made about the baseline intensity, which means that the baseline mortality risk may have any form and change through the time period studied. In the model an assumption about proportional hazards is made, i.e., the risk ratio between groups, for instance between men and women, is set to be constant over time and constant over all values of other variables, if no interaction term is included.

When the explanatory power of the models is compared, the McFadden pseudo R^2 is used (Maddalla, 1983; McFadden, 1974; Veall & Zimmerman, 1992). The McFadden pseudo R^2 is calculated as $1 - L_1/L_0$ where L_0 is the log-likelihood value for a model with only an intercept and no variables included, i.e., a model that analyses each individual's deviation from the mean. L_1 is the log-likelihood value for the full model. Opposed to the R^2 for linear models, the pseudo R^2 is not a measure of the absolute explanatory power of the model, but instead it shows the relative power of the model. Compared to R^2 for linear models, pseudo R^2 gives lower values (Veall & Zimmerman, 1992).

Results

The ability of the two self-rated health questions to predict mortality among the Swedish oldest old is shown in Table 2, which presents results from four separate Cox regression models, two for men and two for women. Global self-rated health is more clearly related to mortality risk among women than among men. In fact, among men the relationship between the entire variable and mortality does not reach the 5% significance level, although the category 'in between' has a significantly elevated mortality risk. No difference is found in mortality risks between the 'poor' and 'in between' categories. This is likely to be an effect of a higher mean age among men reporting poor global self-rated health. For age-referential self-rated health the age distribution is very much the same in all categories, among both men and women. This is also the case for global self-rated health among women.

Age-referential self-rated health is clearly related to mortality among both men and women, although a little stronger among men. For men it is obviously the case that age-referential rating of their health has much greater relevance when judged from the relationship with subsequent mortality. For women, the global and age-referential questions are almost identical in terms of mortality risks.

In Table 3 both the global measure and the age-referential measure are included simultaneously as

Table 1
Descriptive statistics

Self-rated health		Men			Women		
		No. of persons	Average time at risk (days)	% dead	No. of persons	Average time at risk (days)	% dead
Global	Good	116	1488	35.3	121	1595	24.8
	In between	45	1223	53.3	103	1404	42.7
	Poor	17	1086	64.7	30	1156	56.7
Compared to age peers	Better	95	1560	30.5	132	1544	26.5
	About the same	68	1251	51.5	105	1413	41.0
	Worse	15	858	80.0	17	1175	76.5
All		178	1383	42.7	254	1465	35.8

Table 2
Relative mortality risks by self-rated health

Self-rated health		Men	Women
Global	Good (ref.)	1.00 [0.06][a]	1.00 [0.00]
	In between	1.78 (1.07–2.96)	1.92 (1.21–3.05)
	Poor	1.69 (0.83–3.44)	3.46 (1.90–6.30)
	McFaddens pseudo R^2	0.033	0.036
Compared to age peers	Better (ref.)	1.00 [0.00]	1.00 [0.00]
	About the same	2.08 (1.28–3.41)	1.75 (1.12–2.73)
	Worse	4.46 (2.24–8.86)	3.47 (1.82–6.61)
	McFaddens pseudo R^2	0.051	0.033
	$N=$	178	254

[a] P values for the contribution of the entire variable are presented in [ ] next to the reference category and 95% confidence intervals in bracket.

Separate models for different measures of self-rated health and for men and women. Cox proportional hazards regression models for the 1992–1996 period, controlled for age.

Table 3
Relative mortality risk for different self-rated health measures, separate models for men and women

Self-rated health		Men	Women
Global	Good (ref.)	1.00 [0.66][a]	1.00 [0.04]
	In between	1.28 (0.74–2.21)	1.64 (1.00–2.70)
	Poor	1.07 (0.50–2.28)	2.42 (1.17–5.01)
Compared to age peers	Better (ref.)	1.00 [0.00]	1.00 [0.16]
	About the same	1.99 (1.20–3.30)	1.42 (0.88–2.30)
	Worse	4.03 (1.86–8.71)	2.02 (0.92–4.44)
	McFaddens pseudo R^2	0.052	0.040
	$N=$	178	254

[a] P-values for the contribution of the entire variable are presented in [ ] next to the reference category and 95% confidence intervals in bracket.

Cox proportional hazards regression for the 1992–1996 period, controlled for age.

independent variables in the models. For men, the age-referential measure is the more relevant of the two measures in terms of predictive power. Global self-rated health is far from significant in the combined model, whereas age-referential self-rated health is strongly significant with parameter estimates close to those in Table 2. The (McFadden) pseudo R^2 is almost similar to that found for age-referential measure in Table 2 indicating that a model with the two variables does not add explanatory power as compared to a model including only health compared to age peers.

For women only global self-rated health remains significant in the combined model, although the two measures produce similar parameter estimates. The pseudo R^2 is only marginally higher than that for the separate model for global self-rated health. However, the difference between models for men and women does not reach statistical significance.

Discussion

This study examined the effect of a point of reference on the predictive validity of self-rated health for mortality among a representative sample of Swedish elderly people. A limitation of the study is that it includes only those interviewed in person. This was necessary since self-ratings cannot be obtained in proxy interviews. However, this limitation is common to all studies involving elderly people and the proportion of proxy interviews was 13% of all completed interviews.

Self-rated health compared to that of age peers was found to be a better predictor of older men's mortality than was global self-rated health both in separate analyses and when both measures were included in the same analysis. The effects of global self-rated health were more modest. Among women, the global and the

age-referential questions were found to be equally strong predictors of mortality. In separate analyses both the fit of the models and the relative risks were rather similar. When adding both the measures into the model simultaneously, the age-referential question lost much of its predictive power and the fit of the model remained on almost the same level, suggesting that the age-referential question would not add much to the global question. These results are consistent with an earlier study on Swedish elderly people (Manderbacka & Lundberg, 1996) that found the age-referential question to be more closely connected to the global question and have a more similar connection to different measures of health problems and physical functioning among women than among men. Little evidence on the gender difference suggested by the results is available elsewhere, but our result on men is in line with that of Appels et al. (1996) concerning Lithuanian and Dutch men, although they did not enter the measures into the analysis simultaneously.

The gender difference suggested by our results may reflect differences in the way 'health' is understood in making the assessments. Benyamini, Leventhal, and Leventhal (2000) propose that women include information from more various sources than men when assessing their health. Additionally, women are seen to be responsible for the health in the family more often than men (cf. Cornwell, 1984; Miles, 1991). Therefore, women in our study may find it easier to judge their health (and that of others) in reference to several criteria, while men assess their health mainly in relation to that of their age peers.

Another possible explanation could be differential survivorship. In general, women suffer more from chronic disabling conditions whereas men are likely to suffer more from life-threatening conditions. Elderly men are, therefore, likely to be a more selected group than women from the same age groups. Idler (1993) has suggested that the age-referential question would adjust the base of comparisons with the overall higher level of morbidity and disability among age peers. Similar reasoning could be extended to mortality. Among men, the global question could then be assessed in reference to the whole cohort and the age-referential only to surviving age peers.

Earlier research suggests that controlling for other health-related covariates would diminish the predictive validity of self-rated health on mortality or make it disappear altogether (see Idler & Benyamini, 1997). We did not include other health-related covariates in our study, since whether controlling for them would diminish the predictive effect of either or both self-rated health measures or make it disappear, it would not change our finding that different self-rated health measures have a differential predictive validity on mortality.

Our results are in line with the previous findings regarding the predictive validity of self-rated health measures with different wordings for mortality. In our study, both the global and the age-referential questions were found to predict mortality among Swedish elderly people. However, our findings do not support the idea that the self-rated health measure is insensitive to semantic variations in question wording, but rather, that questions with different wordings capture partly different domains of health and that they may do so in a differential way among men and women.

Acknowledgements

This study has been financially supported by the Swedish Council for Planning and Coordination of Research (Grant 990462:4). PM was supported by Academy of Finland (Grants 48600 and 53234).

References

Appels, A., Bosma, H., Grabauskas, V., Gostautas, A., & Sturmans, F. (1996). Self-rated health and mortality in a Lithuanian and a Dutch population. *Social Science & Medicine*, *42*, 681–689.

Benyamini, Y., & Idler, E. L. (1999). Community studies reporting association between self-rated health and mortality. Additional studies 1995–1998. *Research on Aging*, *21*, 392–401.

Benyamini, Y., Leventhal, E. A., & Leventhal, H. (2000). Gender differences in processing information for making self-assessments of health. *Psychosomatic Medicine*, *62*, 354–364.

Blossfeld, H.-P., Hamerle, A., & Mayer, K. U. (1989). *Event history analysis*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Blossfeld, H.-P., & Rohwer, G. (1995). *Techniques of event history modeling*. Mahwah, NJ: Lawrence Erlbaum Associates.

Clayton, D., & Mills, M. (1993). *Statistical models in epidemiology*. Oxford: OUP.

Cornwell, J. (1984). *Hard-earned lives: Accounts of health and illness from east London*. London: Tavistock.

Deeg, D. J. H., van Zonneveld, R. J., van der Maas, P. J., & Habbema, J. D. F. (1989). Medical and social predictors of longevity in the elderly: Total predictive value and interdependence. *Social Science & Medicine*, *29*, 1271–1280.

Fillenbaum, G. G. (1979). Social context and self-assessments of health among the elderly. *Journal of Health and Social Behavior*, *20*, 45–51.

Idler, E. L. (1993). Age differences in self-assessments of health: Age changes, cohort differences, or survivorship? *Journal of Gerontology*, *48*, S289–S300.

Idler, E. L., & Angel, R. J. (1990). Self-rated health and mortality in the NHANES-I epidemiologic follow-up study. *American Journal of Public Health*, *80*, 446–452.

Idler, E. L., & Benyamini, Y. (1997). Self-rated health and mortality: A review of twenty-seven community studies. *Journal of Health and Social Behavior*, *38*, 21–37.

Idler, E. L., & Kasl, S. (1991). Health perceptions and survival: Do global evaluations of health status really predict mortality? *Journal of Gerontology*, *46*, S55–S65.

Kaplan, G. A., & Camacho, T. (1983). Perceived health and mortality: A nine year follow-up of the human population laboratory cohort. *American Journal of Epidemiology*, *117*, 292–304.

Lancaster, T. (1990). *The econometric analyses of transition data*. Cambridge: Cambridge University Press.

LaRue, A., Bank, L., Jarvik, L., & Hetland, M. (1979). Health in old age: How do physicians' ratings and self-ratings compare? *Journal of Gerontology*, *34*, 687–691.

Lundberg, O., & Thorslund, M. (1996). Fieldwork and measurement considerations in surveys of the oldest old. Experiences from the Swedish level of living surveys. *Social Indicators Research*, *37*, 165–187.

Maddalla, G. (1983). *Limited-dependent and qualitative variables in econometrics*. Cambridge: Cambridge University Press.

Manderbacka, K., & Lundberg, O. (1996). Examining the points of reference of self-rated health among Swedish oldest old. *Archives of Gerontology and Geriatrics*, *23*, 47–60.

McFadden, D. (1974). The measurement of urban travel demand. *Journal of Public Economics*, *3*, 303–328.

Miles, A. (1991). *Women, health and medicine*. Milton Keynes: Open University Press.

Mossey, J. M., & Shapiro, E. (1982). Self-rated health: A predictor of mortality among the elderly. *American Journal of Public Health*, *72*, 800–808.

Singer, E., Garfinkel, R., Cohen, S. M., & Srole, L. (1976). Mortality and mental health: Evidence from the midtown Manhattan restudy. *Social Science & Medicine*, *10*, 517–525.

Veall, M. R., & Zimmerman, K. F. (1992). Pseudo-R^2's in the ordinal probit model. *Journal of Mathematical Sociology*, *16*, 333–342.