Scandinavian Journal of Public Health, 2005; 33: 183–189

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ORIGINAL ARTICLE

Self-rated health in relation to age and gender: Influence on mortality risk in the Malmö Preventive Project

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Abstract

Aims: A study was undertaken to examine whether poor self-rated health (SRH) can independently predict all-cause mortality during 22-year follow-up in middle-aged men and women. *Subjects and methods:* Data are derived from a population-based study in Malmö, Sweden. This included baseline laboratory testing and a self-administered questionnaire. The question on global SRH was answered by 15,590 men (mean age 46.4 years) and 10,089 women (49.4 years). Social background characteristics (occupation, marital status) were based on data from national censuses. Mortality was retrieved from national registers. *Results*: At screening 4,261 (27.3%) men and 3,085 (30.6%) women reported poor SRH. Among subjects rating their SRH as low, 1,022 (24.0%) men and 228 (7.4%) women died during follow-up. Corresponding figures for subjects rating their SRH as high were 1801 (15.9%) men and 376 (5.4%) women. An analysis of survival in subjects reporting poor SRH revealed an age-adjusted hazard risk ratio (HR, 95%CI) for men HR 1.5 (1.4–1.7), and for women HR 1.4 (1.2–1.6). The corresponding HR after adjusting for possible social confounders was for men HR 1.3 (1.1–1.4), and women HR 1.1 (0.9–1.4). When additional adjustment was made for biological risk factors the association for men was still significant, HR 1.2 (1.1–1.3). *Conclusion:* Poor SRH predicts increased long-term mortality in healthy, middle-aged subjects. For men the association is independent of both social background and selected biological variables. The adjustment for biological variables can be questioned as they might represent mediating mechanisms in a possible causal chain of events.

Key Words: *Epidemiology, gender, lifestyle, mortality, self-rated health, social*

Introduction

The concept of self-rated health (SRH) has been used as a predictor of both mortality [1–6] and morbidity [6] in epidemiological studies. The power of self-ratings of health in predicting premature death is well documented although the mechanisms involved in this relation are still not fully understood. As a multidimensional concept, SRH status is related not only to objective measures of health but also to various other factors (e.g. socioeconomic status, psychosocial factors, lifestyle, and gender). The rating of self-rated health reflects something very profound within the personality and is based on a subjective consciousness about personal health. SRH reflects illness and there is usually also an association between illness and disease. Mortality is often a good measure of chronic disease outcome and that is the reason why SRH might be a good predictor of mortality [7,8].

A previous study in young Swedish men with a follow-up of 27 years concluded that poor SRH predicts future mortality and that psychological factors seem to be important explanatory factors [9]. A study from a British birth cohort reported that there was no single cause of health inequality, measured as poor SRH, within the cohort at age 33 years [10]. A Swedish study has previously reported that manual workers suffer from illness with greater intensity and frequency than non-manual workers do. It also reported that poor SRH

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(Accepted 5 August 2004)

ISSN 1403-4948 print/ISSN 1651-1905 online/05/030183-7
DOI: 10.1080/14034940410019235

significantly increases the risk of experiencing severe illness among both men and women [11]. Another study showed that there is an interaction between job demands and self-rated health among manual workers and that this might reflect a causal process leading to the experience of severe long-term illness [12]. Both these studies had a seven-year follow-up. Thus, SRH seems to be a predictor of morbidity in both short- and long-term studies.

The participants in the present population-based study have been followed up for 22 years after a baseline screening including physical examination, laboratory testing, and a self-administered questionnaire. This allows separate adjustments for biological as well as social risk factors in both men and women, respectively.

The aim of this study was to evaluate the long-term prediction of poor SRH for all-cause mortality in relation to age and gender.

Subjects and methods

Subjects

From the total population of Malmö (251,431 inhabitants, 1974) in all 22,444 men and 10,902 women participated in the Malmö Preventive Project (MPP) and were screened for biological risk factors and social as well as lifestyle characteristics. The methodology and main results of MPP have been described in full detail elsewhere [13,14]. The attendance rate varied between 64% and 76% (mean 70%) depending on screening year (1974–92).

It is obvious that serious chronic conditions and especially diseases that directly influence the way individuals experience their general physical condition and performance are important for self-ratings [15]. As disease conditions might have a negative impact on the subjects' ratings of their SRH, exclusion criteria used in the present study were self-reported myocardial infarction, diabetes, or cancer at baseline, or not having answered the question on self-reported global health (n=7,667). A total of 25,679 individuals were finally included in this analysis. The mean age of the included men (n=15,590) at screening was 46.4 (SD 5.5) years, and mean age for included women (n=10,089) was 49.4 (7.5) years.

Self-administered questionnaire

The questionnaire included a large number of questions, e.g. on global self-rated health (SRH), smoking, alcohol drinking habits, insomnia, nervous problems, and sick leave on more than three occasions during the previous year before screening. A description of global SRH was based on the answer to the question ''Do you feel completely healthy (yes/no)?'', and categorized into ''optimal/good'' (yes) or ''poor'' (no) SRH.

Smoking status was evaluated based on the question ''Do you smoke (yes/no)?''.

The questions on *alcohol habits* were based on a modified version of the brief Michigan Alcohol Screening Test (MAST). This Malmö modification of the Brief MAST (Mm-MAST) is described elsewhere and contains seven questions [16]. In the present study the Mm-Mast questions analysed were divided into two categories containing confirmative answers to three questions each. One category was named ''moderate alcohol habits'' and the other ''heavy alcohol habits''. ''Moderate alcohol habits'' includes the following three questions: ''Do you usually have a drink before going to a party?'', ''Do you mostly drink alcohol, e.g. a bottle of wine, at weekends or holidays?'', and ''Do you drink a couple of beers, some glasses of wine or a drink to relax on a daily basis?''. The category ''heavy alcohol habits'' includes the following three questions: ''Do you tolerate liquor better now than 10 years ago?'', ''Has it ever happened that after a party you do not remember how you got into bed?'', and ''Do you usually have bad consciousness after a party?''. These two categories were created owing to the J-formed shape of the relationship between alcohol habits and health when a small amount of alcohol has proved to be cardio-protective [17,18]. Teetotallers were not included in the analyses because they have a strong probability of having had a medical history of previous alcohol abuse. If the answer was ''yes'' to one or more of the questions included in either of the two drinking categories the total answer to that category was considered as ''yes''.

As regards *Sleeping problems*. The two items ''Do you use sleeping-pills more than three times a week?'' and ''Have you ever used sleeping-pills over a longer period?'' were merged to form a single variable called ''insomnia''. The answer ''yes'' to one of the two questions included in the new variable insomnia gave the total answer ''yes''.

Self-reported illness was measured by positive answers to questions on nervousness, hospitalization due to psychiatric diagnosis, or sick leave on at least three occasions during the previous year before screening.

Social characteristics. The social background characteristics were based on data from national censuses

closest to the year of screening. The respondents' marital status was categorized into ''married/cohabiting'', ''divorced'', ''unmarried'', or ''widowed''. The respondents' socioeconomic status, based on occupation, was defined as ''unskilled manual worker'', ''skilled manual worker'', ''lower non-manual'', ''intermediate non-manual'', ''higher non-manual'', ''self-employed'', ''retired'', or ''other''.

In the statistical analyses, marital and occupational status was dichotomized into ''married/cohabiting'' or ''divorced/widowed'', and ''non-manual'' or ''manual'', respectively.

Unmarried, retired, or self-employed subjects are not included in the analyses. The category ''manual worker'' includes unskilled or skilled blue-collar workers. The category ''non-manual worker'' includes low, intermediate, or high white-collar workers.

Physical examination

The physical health examination variables included in the present analysis are body mass index (BMI, kg/m^2), blood pressure (mmHg), heart rate (beats/min), and fasting blood samples for serum cholesterol (mmol/L) and serum triglycerides (mmol/L), in addition to blood glucose (mmol/L). Blood pressure was measured in the right arm to the nearest 5 mmHg after 10 minutes' rest in a supine position, and a mean of two readings was recorded. Lipids and blood glucose were measured by use of standard methods at the Department of Clinical Chemistry, University Hospital, Malmö.

Register follow-up analyses on mortality

All available subjects were followed for a mean of 22 years (range 20–25 years) in national registers for all-cause mortality, until 31 December 1999. The Swedish Board on Health and Welfare, Stockholm, provided data from national registers based on death certificates. The overall autopsy rate was 44% in Malmö during the period, which is why the diagnoses on local death certificates should be reasonably trustworthy.

Statistical methods

The statistical program SPSS was used for all analyses. Risk factors at baseline were described by means and standard deviation (SD). Student's *t*-test was used for test of differences in continuous variables, and a chi-squared test for differences in proportions. Survival analyses were performed using Cox's proportional hazards model to calculate hazard risk ratios (HR), with 95% confidence intervals (CI). Adjustments were made first for age, social class, lifestyle, self-reported mental problems, and frequent sick leave (Model A). Second, adjustments were made for Model A and BMI, systolic blood pressure, diastolic blood pressure, heart rate, cholesterol, triglycerides, and fasting glucose (Model B). Finally, adjustment was also made for the interaction term between poor SRH and biological variables (Model C). All analyses were made separately for men and women. A *p*-value of less than 0.05 was considered significant.

Results

Baseline characteristics of subjects with poor SRH

At the baseline screening, 4,259 men (27.3 %) and 3,076 women (30.6 %) stated themselves not to be completely healthy, e.g. to have poor SRH (Table I).

Mean age for those who reported poor SRH was 46 years for men and 50 years for women (Table II). Among men with poor SRH, 61.1% reported having manual work, 27.8% being divorced or widowed, 50.6% being smokers, 42.6% having moderate and 25.6% heavy alcohol habits, 14.2% insomnia, 20.6%

Table I. Numbers and proportions (%) of subjects reporting poor self-rated health (SRH), stratified for age-groups and gender.

	Women (n^a=10,089)		Men (n^a=15,581)	
Age-group (years)	poor SRH	%	poor SRH	%
–34	146	24.0	107	20.1
35–39	194	21.0	218	23.9
40–44	265	29.0	748	25.4
45–49	505	29.2	2,818	28.0
50–54	738	31.4	27	38.0
55–	1,237	35.0	343	32.2
All	3,085	30.6	4,261	27.3

[a]All subjects reporting on SRH.

Table II. Baseline characteristics in relation to self-rated health (SRH) and gender: means (SD) and proportions (%).

	Men			Women		
Variables	SRH+	SRH−	*p*-value	SRH+	SRH−	*p*-value
n	11,325	4,265		7,004	3,085	
Age, years (SD)	46.3(5.5)	46.9(5.3)	<0.001	49.0(7.7)	50.4(7.0)	<0.001
Social background (%)						
– manual workers	46.4	61.1	<0.001	45.7	58.0	<0.001
– non-manual workers	53.6	38.9	<0.001	54.3	42.0	<0.001
– divorced	21.7	27.8	<0.001	26.5	31.5	<0.001
– married/cohabiting	78.3	72.2	<0.001	73.5	68.5	<0.001
Lifestyle and work (%)						
– smokers	48.1	50.6	0.005	35.7	38.2	0.022
– moderate alcohol habits[a]	46.0	42.6	<0.001	32.2	23.7	<0.001
– heavy alcohol habits[a]	21.9	25.6	<0.001	7.6	8.8	0.049
Self-reported mental health (%)						
– insomnia	4.7	14.2	<0.001	7.3	18.4	<0.001
– nervousness	8.5	20.6	<0.001	11.1	22.9	<0.001
– psychiatric hospitalization	2.3	6.3	<0.001	3.1	6.8	<0.001
– sick leave: more than three episodes during the previous year	7.3	23.7	>0.001	7.2	23.6	<0.001

[a]Based on Mm-Mast classification (range 1–6).

nervousness, 6.3% psychiatric hospitalization, and 23.7% episodes of sick leave more than three times during the previous year. The corresponding figures (%) among women were 58.0, 31.5, 38.2, 23.7, 8.8, 18.4, 22.9, 6.8, and 23.6 respectively (Table II).

Mean values of biological risk factors differed only slightly from expected normal values but some differed in relation to SRH. Among men, significant age-adjusted differences were found for BMI, blood pressure, heart rate, and triglycerides. Among women corresponding differences were found for BMI, systolic blood pressure, heart rate, cholesterol, triglycerides, and fasting glucose (Table III).

Follow-up and mortality risk associated with poor SRH

During follow-up, 1,022 (24.0%) of the men reporting poor SRH died. The corresponding number for women was 228 (7.4%). An analysis of survival showed an age-adjusted hazard risk ratio (HR, 95 %CI) of 1.53 (1.41–1.65) for men reporting poor SRH and for corresponding women HR 1.36 (1.16–1.61) (Table IV).

After adjustment for social background, lifestyle, self-reported mental problems, and frequent sick leave, the HR for men was 1.26 (1.14–1.40) and for women HR 1.10 (0.90–1.36). When additional adjustment was made for individual biological risk

Table III. Biological risk factors at baseline in relation to self-rated health (SRH) and gender: means (SD).

	Men					Women				
Variables	SRH+	SD	SRH−	SD	*p*-value[a]	SRH+	SD	SRH−	SD	*p*-value[a]
BMI (kg/m^2)	24.8	3.21	25.1	3.48	<0.001	24.0	3.95	24.9	4.55	<0.001
Blood pressure (mmHg)										
– systolic	128.2	15.2	129.2	16.3	0.013	124.0	16.3	125.7	16.9	0.008
– diastolic	86.2	9.68	87.4	10.1	<0.001	81.4	9.04	82.1	9.20	0.063
Heart rate (beats/min)	67.1	0.97	68.4	10.2	<0.001	67.9	8.95	68.5	8.86	<0.001
Cholesterol (mmol/L)	5.69	1.05	5.68	1.04	0.240	5.74	1.08	5.91	1.14	<0.001
Triglycerides (mmol/L) (mmol/L)	1.33	1.62	1.42	1.67	<0.001	0.96	1.54	1.05	1.56	<0.001
Fasting glucose (mmol/L)	4.88	0.75	4.89	0.89	0.410	4.80	0.66	4.88	0.77	<0.001

[a]Age-adjusted *p*-values.

factors at baseline the risk associated with poor SRH was still significant for the men, HR 1.21 (1.09–1.34). A final adjustment for the interaction terms of poor SRH and biological variables resulted in a sex-adjusted HR 1.24 (1.12–1.33) (Table IV).

Discussion

The main finding of this epidemiological observational study is that poor SRH is a strong independent predictor of mortality among middle-aged men, as well as an age-adjusted significant predictor of mortality for corresponding women. When social factors were added to the statistical model, the significance of poor SRH for predicting mortality in women was lost but it remained for men.

Several studies on poor SRH and mortality have reported significant associations among both men and women, but none of these study results was, however, adjusted for self-rated mental health indicators [1–3,5]. This might partly explain the non-significant results among women in the present study.

The result was still significant (HR 1.2) for men when selected biological risk factors were finally added to the model (see Table IV). This suggests that poor SRH might be a stronger predictor of mortality among men than among women. This interpretation is supported by evidence in a review of 27 published papers [4]. In summary, the result of the present population-based study from Malmö is in accordance with previous papers on the relationship between poor SRH and mortality [1–6,9], but based on national register-derived mortality data and long-term follow-up (22 years) for a more accurate evaluation of the aim.

Men are believed to rate their health mainly by comparing their health status with the health of other men, whom they often judge as having worse global health than themselves. Women tend to rate their SRH by considering various sources and are also trained in judging the health status of themselves and others by having the responsibility for the health of the family. Middle-aged men tend to suffer more from life-threatening conditions than corresponding women do, but women suffer more from chronic disabling conditions than men do [19,20].

A randomized, observational Swedish study (n=5,470) performed in 1995 showed that women generally rate their health worse than men do [8]. Other analyses from the same study, however, show that the explanatory pattern of how men and women rate their health is very much alike. Differences found were that women report a stronger relationship between SRH and chronic pain than men do, while men report a stronger relation between SRH and chronic disease than women do. Lifestyle factors may have a stronger influence on SRH among men than among women [8].

Gender-based health inequalities are also explained by differential vulnerabilities to social forces acting on men and women. The direction and the magnitude of gender differences in health vary according to the symptom/condition and phase of the life cycle [21]. This might partly explain why SRH in the present study was a stronger predictor among middle-aged men than among corresponding women.

The exclusion of subjects with self-reported medical history of myocardial infarction, diabetes, or cancer at baseline might partly explain the non-significant results for women of the Models A, B, and C analysis (see Table IV).

Limitations of the study

In the literature there is still no evidence for a superior ''gold-standard'' method to measure the concept of SRH. However, it has been stated that in longitudinal studies a non-comparative measure of SRH is more appropriate than the age-comparative alternative, where the respondent is asked to compare his or her present health status with that

Table IV. Hazard risk ratio (HR) for total mortality in relation to poor self-rated health (SRH) adjusted for age and risk factors at baseline (models A and B), and interaction terms (Model C). HR (95% confidence intervals, CI).

	Women		Men		All	
Poor SRH	HR	95% CI	HR	95% CI	$HR_{sex\text{-}adj.}$	95% CI
Age-adjusted	1.36	1.16–1.61	1.53	1.41–1.65	1.49	1.39–1.60
Adjusted A[a]	1.10	0.90–1.36	1.26	1.14–1.40	1.22	1.11–1.34
Adjusted B[b]	1.08	0.88–1.33	1.21	1.09–1.34	1.18	1.08–1.30
Adjusted C[c]	1.14	0.92–1.39	1.26	1.14–1.40	1.24	1.12–1.33

HR adjusted for: [a]Model A: age, social background, lifestyle, self-reported mental problems, and frequent sick leave. [b]Model B: Model A and biological variables. [c]Model C: Model B and interaction terms with poor SRH and biological variables.

of others of the same age [22]. The single-item question ''Do you feel completely healthy?'' used in the MPP gives the respondent the opportunity simply to summarize his or her global health into a ''yes'' or ''no'' answer.

In many studies where the respondent is offered several answer options to choose from, a common way of using these answers in analyses is to dichotomize them into two categories, ''good/high'' or ''poor/low''. Dichotomization might be considered a rough measure but was made to increase statistical power in such studies. A scale with 4–7 alternative options is proposed to give more information because it is more sensitive, but on the other hand dichotomization is often done in order to get a clearer understanding of the relationship. It has also been established that reliable estimates of global SRH have a tendency to decrease when a large number of response alternatives is used [15]. The negative dimension of this method is that the measure becomes less specific.

It is obvious that serious, chronic conditions and diseases that directly influence the way individuals experience and report their general physical condition and performance are important for SRH [23–25]. It could, however, be argued that SRH captures sub-clinical or undiagnosed disease and that SRH is able to estimate the degree of present illness [26]. As most people are likely to be rather well informed about their health status from external sources such as doctors and nurses they have an immediate experience and knowledge of their health and health-related problems. The individuals will then summarize these elements into their reported SRH [22].

It has been suggested that controlling for health-related covariates would diminish the predictive validity of SRH on mortality or make it disappear altogether [4]. Furthermore, it has been shown that perceived ill health negatively modifies the impact of biological risk factors, e.g. on cardiovascular morbidity and mortality [27,28]. According to these findings, adjustment for biological factors during the statistical analyses might be questioned. However, as people die of biological responses to health-related processes and the MPP was a large prospective cohort study including selected biological as well as social data, the result of the present study has been adjusted for these factors in order to examine whether poor SRH alone can predict future mortality. However, unknown social, psychological or biological factors might be part of the explanation for the results of the present study.

Future research directions

There is a need to evaluate further what happens over time in the association between SRH and mortality among men as well as women, and to study possible causal mediators of this association. A Swedish study has shown that women reporting a low Sense of Coherence (SOC) are characterized by significantly higher levels of triglycerides and lower HDL cholesterol levels (dyslipidaemia) than women reporting medium or high SOC [29]. In the present study lipids were higher in women rating their SRH as poor compared with women rating their SRH as optimal/high (see Table III). This significant difference suggests that other factors related to poor SRH are able to influence lipid levels, a fact that calls for future research.

As the literature [6] suggests that the association between SRH and mortality could be due to confounding, the explanation for our results may be that the social factors and biological variables included in the present study do not fully represent these confounders. Other potential mediators should therefore be evaluated in prospective studies. The differing results among women compared with men in the present study might be due to gender differences in the way ''health'' is interpreted by individuals when they are assessing their SRH.

Conclusions

Poor SRH predicts an increased long-term mortality among healthy, middle-aged men and women. For men the association is independent of social background characteristics and some biological variables. Adjustment for biological risk factors can be questioned as these variables might represent mediating mechanisms in a possible causal chain of events.

Acknowledgements

This study was supported by a financial grant from the Swedish Society of Medicine.

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