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ORIGINAL ARTICLE

Do social relations explain health inequalities? Evidence from a longitudinal survey in a changing eastern German region

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Abstract
Objectives This study explores the contribution of social relations to explain inequalities in self-rated health in a changing north-eastern German region. So far, there are only few studies that analysed the mediating effects of social relations in a longitudinal design.
Methods We used data from the Study of Health in Pomerania (SHIP) consisting of 3,300 randomly selected men and women at baseline (2001), and at the 5-year follow-up (2006). Indicators of social inequality were education, equivalent household income and occupational status. Social relations were estimated by the Social Integration Index (SII) and the perceived instrumental and emotional support. Self-rated general health was assessed at both waves of data collection.
Results Depending on the indicators used, social relations explain up to 35% of the inequalities in self-rated health. Changes in odds ratios are slightly more pronounced when education and income are used as inequality indicator and when adjusting for the SII.
Conclusions Overall findings suggest that social relations are an important explanatory factor for health inequalities in a deprived German region.

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Introduction

Numerous studies provide evidence for a social gradient of morbidity and mortality: lower socioeconomic status (SES) is associated with reduced physical and mental health (Huisman et al. 2003; Mackenbach et al. 2003; Wilkinson and Marmot 2003). Possible explanations among others are psychosocial factors, particularly psychosocial stress and social relations (Siegrist and Marmot 2006). This study focussed on the mediating role of social relations regarding the association of social inequality and health.

In various studies social relations were shown to be an important health determinant (Berkman and Glass 2000; Cohen 2004; Holt-Lunstad et al. 2010; House et al. 1988) and a contributing factor to health behaviour (Weyers et al. 2010). Generally, structural and functional aspects are distinguished regarding social relations (Berkman and Glass 2000; Cohen 2004). Structural or quantitative characteristics of social relations are, for instance, the frequency, intensity or permanence of social contacts. Such indicators are well established in social-epidemiologic research (Berkman and Glass 2000). Berkman and Syme (1979) introduced the Social Network Index (SNI), which provides information on the extent of social integration. Functional or qualitative characteristics of social relationships are merged under the title "social support", typically divided into two subtypes: instrumental and emotional support (Cohen 2004). Instrumental support is related to the provision of material aid, such as financial assistance or help with daily tasks, while emotional

support refers to the expression of empathy, caring, understanding and trust.

Evidence for the association between lower SES and poor social relations is scattered and inconsistent. Findings in previous studies differed depending on the indicators used (Turner and Marino 1994; von dem Knesebeck and Geyer 2007; Weyers et al. 2008).

So far, only few studies, showing inconsistent results, have systematically examined whether the association between social inequality and health is mediated by social relationships. British studies found that social support is not a major influence in explaining employment grade differences in coronary heart disease, depression, and physical functioning (Marmot et al. 1997; Stansfeld et al. 2003). Similarly, a study conducted in Germany showed that the mediating effect of social relationships (emotional support and social contacts) on the association between SES and health (self-rated health, depression and functional limitations) among the aged is weak (von dem Knesebeck 2005). Another German analysis yielded mediating effects of leisure-cultural social involvement in both east and west Germany concerning the association between income and self-rated health, whereas network-oriented social involvement was less important (Nolte and McKee 2004). A comparative study found that emotional support explains little of the educational differences in self-rated health among women and men in most European countries (von dem Knesebeck and Geyer 2007), and the 1958 British birth cohort study showed a poor impact of social relations on SES differences in self-rated health (Power et al. 1998). Another cohort study illustrated contributions of strong social networks to explain inequalities in mortality; (Skalicka et al. 2009) and Kim et al. (2010) found out that poorer self-rated health among lone South Korean mothers is partly mediated by social support. A cross-sectional study in the United States found little evidence that social support and social integration mediate the association between SES and self-rated health (Gorman and Sivaganesan 2007).

Thus, it can be summarised that the association between social inequality, social relationships and health is fairly unclear and results show an inconsistent pattern. Studies indicate that the magnitude of the mediating effect varies when different populations are studied and different indicators of social inequality and social relationships are used. Moreover, most of the studies are cross-sectional and therefore conclusions are limited. Further investigations with a longitudinal design are needed. Summing up, to our knowledge this is one of the first analyses to assess whether social relations mediate the association between social inequality and self-rated health, including both structural and functional aspects of social relations in a prospective design.

A further specific focus of this study is to examine these associations in the north-east of Germany (Federal State Mecklenburg-West Pomerania), a deprived region characterised by social change, population decrease due to migration, undersupply of medical services, high premature mortality and high prevalence of common risk factors and diseases (Destatis 2010; Statistisches Amt Mecklenburg Vorpommern 2009; Völzke et al. 2011; Reichert-Schick 2008; Fendrich and Hoffmann 2007; Latzitis et al. 2011). Compared to the general German population, this region is also deprived in terms of socioeconomic characteristics like income, unemployment rate and education (Destatis 2002, 2010; Destatis and WZB 2011). Since the German reunification in 1990, the eastern part of Germany is still in a process of major social transition including economic, political and social shift accompanied by changes in social attitudes and norms (John et al. 2001). These living conditions and persisting sociodemographic and socioeconomic disparities have an impact on the magnitude of health inequalities (John et al. 2001; Nolte and McKee 2004; Voigtlander et al. 2010). This is also true for West Pomerania, an outlying region in the Federal State Mecklenburg-West Pomerania (Destatis 2010; Völzke et al. 2011; Reichert-Schick 2008; Latzitis et al. 2011). We assume that especially in this peripheral region of transition and deprivation informal social relations play an important role for coping with socially determined inequalities in health (Nebelung et al. 2010; Mackereth and Appleton 2008). It is known that socioeconomic features of areas can have an impact on population health in many ways (Macintyre et al. 1993; Malmström et al. 2001). Different types of socio-environmental influences on health are distinguished such as the provision of decent housing, affordable and nutritious food, as well as, options for safe and healthy recreation or leisure time activities like sports places, playgrounds and theatres. Moreover, the services provided to support people in their daily lives including education, transport, community organisations and health, and welfare services could be important criteria (Macintyre et al. 1993). Social relations can compensate the possible health damaging effects in peripheral, undersupplied regions lacking such services (Nebelung et al. 2010). To tackle this deprivation, it is important that solidarity, participation and social support help to cope with adversities in everyday life and that furthermore, collaboration, reciprocal practical help and communication promote self-efficacy and recognition (Nebelung et al. 2010, Saltzman and Holahan 2002).

In particular, three topics are addressed: the association between SES and social relations, the association between social relations and self-rated health, and the association between SES and self-rated health, gradually adjusted for social relations to figure out their contributory effects.

Methods

Study population

The analyses are based on data from the longitudinal Study of Health in Pomerania (SHIP) which investigates common risk factors, subclinical disorders and manifest diseases in a high-risk population of north-eastern Germany (Völzke et al. 2011). For the present analysis, data from the first survey (1997–2001) and from the 5-year follow-up (2002–2006) are used. This population-based cohort study was conducted in West Pomerania and included three cities: 12 towns and 17 randomly selected small towns. Proportional to the population size of each community and stratified by age and gender, the subjects were drawn at random from official population registers of the selected communities. Based on the entire study population of 212,157 inhabitants, the sample consisted of 7,008 men and women aged 20–81. Only persons with German citizenship and main residency in the study area were included (John et al. 2001). The net sample comprises 6,265 eligible persons whereof 4,308 finally participated (response rate 68.7%). For the 5-year follow-up, all 4,308 baseline respondents were consulted again. Excluding 361 migrated or deceased subjects, 3,949 eligible participants remained for the examination of whom 3,300 were surveyed again (response rate 83.6%). Our analyses are based on these 3,300 cases. Significant predictors for non-response at follow-up were female sex, lower education, lower income and unemployment. Middle-aged subjects were more likely to participate at follow-up (Haring et al. 2009). Moreover, non-responders were less socially integrated and supported.

The study was approved by the Ethics Committee of the University of Greifswald and strictly adhered to data safety regulations. For our analyses, data from a computer-aided health-related interview and a health- and risk-factor-related questionnaire were used. Study design, recruitment, sampling procedure and information on measures and examinations have been extensively described elsewhere (Völzke et al. 2011; John et al. 2001).

Measures

Socioeconomic status (SES)

Three indicators of SES were measured at baseline (education, equivalent household income and job status). Education was assessed by the highest level of degree. Regarding the German school system, three general educational levels were defined: secondary schools (9 years), intermediate schools (10 years) and grammar schools (12–13 years). In our study, we accordingly distinguished between "no level/low levels", "medium level" and "high level" of education. Equivalent household income contained information on disposable income and household size, the latter including number of adults and children according to OECD criteria. The first household member was attributed with a weight of 1, while every other member was given a weight of 0.5. For further analysis, the scale is divided into quartiles. Job status was calculated according to the Standard Occupational Prestige Scale (SIOPS) (Ganzeboom and Treiman 1996), divided into tertiles for statistical examinations.

Social relations

To capture the structural aspects of social relations, the Social Integration Index (SII) by Berkman (Berkman et al. 2004), a modified Version of the Social Network Index (SNI) (Berkman and Syme 1979) was calculated. This instrument covers marital status or cohabitation, the frequency of contacts with children, relatives and close friends as well as the affiliation with voluntary associations. Each of these three domains scores from 0 to 2 depending on the level of integration: living with a partner was scored 2, all else 0; number of close ties was scored 0 for 0–2 contacts, 1 for 3–11 contacts and 2 for 12 or more contacts; participation in voluntary associations was coded 0 for no clubs or no organisation, 1 for one organisation, 2 for participation in more than one organisation. The total score ranging from 0 to 6 was categorised into four levels of integration: level I (Score 0–1), II (Score 2 and 3), III (Score 4 and 5) and IV (Score 6). These four levels were dichotomised for further analyses when the SII operates as an outcome variable: low integration (level I) and higher integration (levels II–IV).

Functional aspects of social relations were captured by questions assessing the perceived instrumental and emotional support. Five items were taken from the Medical Outcome Study (MOS) Social Support Survey (Sherbourne and Stewart 1991). Four items were related to instrumental support as they refer to the provision of material aid, i.e. help with cooking, shopping, consultations and financial assistance (Cronbach's Alpha 0.89). Emotional support was measured by one item assessing the availability of a trustworthy person one can talk to about personal problems. Each social support item was measured on a 5-point Likert scale ranging from "always" (5) to "never" (1). Concerning instrumental support, a sum score was generated, which was divided by the number of items to assess the respondents' average perception. The variables of emotional and instrumental support were also dichotomised into "always/mostly" and "never/seldom/sometimes" when operating as an outcome. The latter indicates poor emotional support. Both aspects of social relations were measured at baseline.

Self-rated general health status

To assess the subjective general health, respondents are requested to estimate their health status ("How would you describe your general health status?") on a 5-point Likert scale (excellent/very good/good/rather poor/poor). The variable was dichotomised into good ("excellent/very good/good") and poor subjective health ("rather poor/poor"). Ratings of subjective health are an established health measure (Idler and Benyamini 1997; DeSalvo et al. 2006). Data on the subjective general health status were available for both baseline and follow-up.

Statistical analyses

Associations between SES, social relations and general health at baseline and follow-up were analysed by using multiple logistic regressions. Odds ratios (OR) and 95% confidence intervals are displayed. Adjustments were made for age and gender. To analyse whether the association between SES and self-rated health can be explained by social relations, several models were calculated. Conceptual, strategic and statistical considerations regarding mediating effects have been described extensively elsewhere (Baron and Kenny 1986; MacKinnon and Dwyer 1993). In general, a mediator variable is characterised as a given variable which accounts for the relation between the predictor and the criterion. To examine the associations between social inequalities, social relations and self-rated health, several regression analyses were applied in this study: First, an association between the predictor (SES) and the mediator (social relations) was investigated. Furthermore, associations between the mediator and the criterion (self-rated health status at follow-up) were analysed. In a last step, the association between predictor and criterion, adjusted for the mediator variables, was calculated.

As the study contains longitudinal data, the second and third regression models, which include general health at follow-up as criterion, were additionally adjusted for general health status at baseline. The mediating role of social relations is determined by the percentage reduction in the OR for SES after inclusion of the indicators of social relations using the formula $([OR_{Model\ 1} - OR_{Model\ 1+social\ relations}]/[OR_{Model\ 1} - 1]) \times 100$ (Skalicka et al. 2009; von dem Knesebeck and Geyer 2007; Kim et al. 2010). Percentage change is displayed when OR is statistically significant in the first model which is only adjusted for age and gender ($p < 0.05$). All analyses were conducted with the statistical programme package PASW 18.0.

Results

The sample characteristics and distributions of the variables are displayed in Table 1. Nearly 19% of the sample reported a low social integration according to the SII. 22 and 19%, respectively indicated that instrumental or emotional support would be never, seldom or sometimes

Table 1 Sample characteristics and distribution of variables ($N = 3{,}300$); *n* (%); north-eastern Germany (2001–2006)

Variables (no. of missings)	
Age in years (0), mean (SD)	49.2 (15.4)
Gender (0)	
Male	1,589 (48.2)
Female	1,711 (51.8)
Education (15)	
No level/low level	1,193 (36.3)
Medium level	1,558 (47.4)
High level	534 (16.3)
Equivalent household income (Euro) (166), Mean (SD)	887.5 (444.4)
Quartiles	
Very low	785 (25.0)
Low	757 (24.2)
Average	861 (27.5)
High	731 (23.3)
Occupational status (SIOPS) (114), Mean (SD)	43.5 (13.0)
Tertiles	
Lower	1,073 (33.7)
Medium	1,112 (34.9)
Upper	1,001 (31.4)
Social Integration Index (309)	
Level I (low)	552 (18.5)
Level II	1,579 (52.8)
Level III	827 (27.6)
Level IV (high)	33 (1.1)
Instrumental support (106)	
Never	187 (5.9)
Seldom	222 (7.0)
Sometimes	274 (8.6)
Mostly	749 (23.5)
Always	1,762 (55.2)
Emotional support (45)	
Never	108 (3.3)
Seldom	216 (6.6)
Sometimes	305 (9.4)
Mostly	963 (29.6)
Always	1,663 (51.1)
Self-rated general health status	
Baseline (26)	
Poor/rather poor	567 (17.3)
Excellent/very good/good	2,707 (82.7)
Follow-up (16)	
Poor/rather poor	544 (16.6)
Excellent/very good/good	2,740 (83.4)

Table 2 Multiple logistic regression of socioeconomic status and social relations at baseline: odds ratios (OR) and 95% confidence intervals (CI); adjusted for age and gender ($N = 3{,}300$); north-eastern Germany (2001–2006)

	Social Integration Index (level I) OR (95% CI)		Instrumental support (never/seldom/sometimes) OR (95% CI)		Emotional support (never/seldom/sometimes) OR (95% CI)	
Education (reference category: high level)						
Medium level	**1.34**	(1.00–1.78)	**1.42**	(1.10–1.84)	**1.63**	(1.22–2.19)
No level/low level	**2.79**	(1.99–3.91)	**1.91**	(1.45–2.51)	**2.36**	(1.72–3.22)
Equivalent household income (reference category: high)						
Average	1.08	(0.77–1.50)	1.23	(0.96–1.58)	1.05	(0.80–1.39)
Low	**1.75**	(1.29–2.40)	**1.43**	(1.11–1.84)	**1.57**	(1.19–2.06)
Very low	**3.46**	(2.58–4.64)	**2.13**	(1.66–2.72)	**2.31**	(1.77–3.01)
Occupational status (SIOPS) (reference category: upper tertile)						
Medium tertile	**1.66**	(1.30–2.13)	1.02	(0.83–1.26)	1.16	(0.92–1.47)
Lower tertile	**1.62**	(1.26–2.09)	**1.40**	(1.14–1.72)	**1.68**	(1.35–2.10)

Significant odds ratios are given in bold ($p < 0.05$)

Table 3 Multiple logistic regression of social relations at baseline and general health status at follow-up: odds ratios (OR) and 95% confidence intervals (CI); adjusted for age, gender and general health status at baseline ($N = 3{,}300$); north-eastern Germany (2001–2006)

	General health status (poor/rather poor) OR (95% CI)	
Social Integration Index (reference category: level III/IV)		
Level II	**1.31**	(1.00–1.71)
Level I	**1.63**	(1.16–2.29)
Instrumental support (reference category: always)		
Mostly	1.08	(0.83–1.41)
Sometimes	1.16	(0.79–1.69)
Never/seldom	1.16	(0.85–1.60)
Emotional support (reference category: always)		
Mostly	1.04	(0.81–1.34)
Sometimes	**1.42**	(1.00–2.02)
Never/seldom	1.06	(0.75–1.49)

Significant odds ratios are given in bold ($p < 0.05$)

available while about 17% rated their general health status as rather poor or poor at baseline and follow-up.

Table 2 shows the associations between the indicators of SES and social relations at baseline adjusted for age and gender. A lower SES was significantly associated with both lower social integration and lower social support. Significant ORs varied between 1.34 and 3.46. The strongest associations were found between measures of SES and the SII. Overall, a linear association between SES and social relations was observed: the lower the SES, the higher the risk of reporting low levels of social integration and social support.

Associations between social relations and the self-rated general health status at follow-up are shown in Table 3. Three regressions were calculated, each adjusted for age, gender and general health at baseline. First, the SII was included as predictor, thereafter the two indicators of social support were introduced. A clear significant prospective association with the general subjective health status was found for the SII only.

Table 4 shows the associations of SES and social relations with the general health status at follow-up. Four models were calculated: The first model was adjusted for age, gender and the general health status at baseline. Model 2 was additionally adjusted for the SII whilst in Model 3, social support was additionally introduced to the first model. In Model 4, all indicators of social relations were introduced simultaneously.

These four models were calculated separately for each measure of SES. Furthermore, the respective percentage change of the ORs of the Models 2, 3 and 4 compared to Model 1 is displayed when the ORs were statistically significant in Model 1 ($p < 0.05$). Every significant OR in Model 1 is reduced in the other models. Depending on the SES indicator used, the percentage change of the ORs varies between 8 and 35%. Changes are a slightly more pronounced when education and equivalent household income were used as inequality indicators. Furthermore, structural aspects of social relations reveal more explanatory power than functional aspects. When all three indicators of social relations are introduced simultaneously reductions are most pronounced.

Discussion

The present study analysed whether social relations contribute to the explanation of health inequalities.

Table 4 Multiple logistic regression of social relations and socioeconomic status at baseline and general health status at follow-up: odds ratios (OR), 95% confidence intervals (CI) and percentage change ($N = 3{,}300$); north-eastern Germany (2001–2006)

	General health status (poor/rather poor)											
	Education (reference category: high level) OR (95% CI)			Change (%)	Equivalent household income (reference category: high) OR (95% CI)			Change (%)	Occupational status (reference category: upper tertile) OR (95% CI)			Change (%)
Model 1												
Adjusted for age, gender and general health status at baseline	Medium	**1.45**	(1.02–2.06)		Average	1.25	(0.91–1.71)		Medium tertile	1.00	(0.76–1.31)	
	Low	**1.61**	(1.13–2.30)		Low	1.24	(0.89–1.72)		Lower tertile	**1.51**	(1.16–1.96)	
					Very low	**1.84**	(1.33–2.53)					
Model 2												
Model 1 additionally adjusted for Social Integration Index	Medium	1.39	(0.96–2.02)	−13	Average	1.27	(0.91–1.77)		Medium tertile	1.00	(0.75–1.33)	
	Low	**1.48**	(1.01–2.16)	−21	Low	1.14	(0.80–1.62)		Lower tertile	**1.40**	(1.05–1.86)	−22
					Very low	**1.59**	(1.11–2.26)	−30				
Model 3												
Model 1 additionally adjusted for instrumental and emotional support	Medium	1.39	(0.97–1.99)	−13	Average	1.24	(0.90–1.71)		Medium tertile	0.98	(0.74–1.29)	
	Low	**1.53**	(1.06–2.20)	−15	Low	1.22	(0.88–1.71)		Lower tertile	**1.44**	(1.11–1.89)	−14
					Very low	**1.77**	(1.28–2.46)	−8				
Model 4												
Model 1 additionally adjusted for all three indicators of social relations	Medium	1.31	(0.90–1.91)	−31	Average	1.24	(0.89–1.74)		Medium tertile	0.97	(0.72–1.30)	
	Low	1.42	(0.97–2.10)	−31	Low	1.12	(0.78-1.60)		Lower tertile	**1.36**	(1.02–1.82)	−29
					Very low	**1.55**	(1.08–2.21)	−35				

Significant odds ratios are given in bold ($p < 0.05$)

Percentage change in OR (Model 1 compared separately at a time with Model 2, Model 3 and Model 4) using $([OR_{\text{Model 1}} - OR_{\text{Model 1+social relations}}]/[OR_{\text{Model 1}} - 1]) \times 100$. Percentage change is displayed when OR is statistically significant in Model 1 ($p < 0.05$)

Furthermore, the associations between SES and social relations, as well as, between social relations and general health have been estimated. This is one of the first studies that covers different aspects of social relations (social support and social integration) as mediator variables to examine the association between SES (education, equivalent household income, job status) and self-rated general health in a longitudinal perspective (Power et al. 1998).

Our results indicate that SES is significantly associated with different aspects of social relations, as it has been shown in some former analyses concerning education (von dem Knesebeck and Geyer 2007; Weyers et al. 2008), income (Weyers et al. 2008; Nieminen et al. 2010) and job status (Stansfeld et al. 1998). In addition, lower SES is significantly associated with worsening self-rated health, which is in line with previous prospective findings (Huisman et al. 2003; Siegrist and Marmot 2006).

Furthermore, the results show a significant association of the structural aspects of social relations measured by the SII with self-rated health in a prospective design. This is in line with former studies, that analysed the association between social relations and health regarding morbidity, mortality and self-rated-health (Berkman and Glass 2000; Cohen 2004; Holt-Lunstad et al. 2010; House et al. 1988; Melchior et al. 2003). Associations between the social relations' functional aspects at baseline and general health at follow-up are weaker.

The analyses indicate a mediating role of social relations on the association between SES and health in the deprived region under study depending on the indicators used. The percentage change in ORs after introducing the indicators reveals that both a low social integration and poor social support can partly explain social inequalities in self-rated health. This holds true for all three SES indicators showing strongest effects for education and equivalent household income and slightly lower but still clear effects for occupational status. Moreover, structural aspects of social relations show stronger impacts than functional ones. The explanatory power in our study ranges from 8 to 35% indicating strongest reduction when introducing all three indicators of social relations. Therefore, our findings suggest that social relations are an important explanatory factor for health inequalities in a deprived German region. Our results are partly in line with the above-mentioned studies indicating overall a rather weak and inconsistent mediating role of social relations concerning health inequalities (Marmot et al. 1997; von dem Knesebeck 2005; Nolte and McKee 2004; von dem Knesebeck and Geyer 2007; Power et al. 1998; Gorman and Sivaganesan 2007).

The study differs from former analyses in various ways: (1) we used multiple indicators to estimate SES and social relations, (2) the study has a prospective design, and (3) the study was conducted in a region of special interest. As described in the Introduction, we assume that informal social relations can promote health of people affected by lower SES in changing and deprived regions or communities (Nebelung et al. 2010; Mackereth and Appleton 2008). Social support has been found to be associated with self-efficacy and coping behaviour (Holahan and Holahan 1987; Saltzman and Holahan 2002). Through increased social relations self-efficacy and sense of coherence might operate as health promoting factors in such peripheral environments (Nebelung et al. 2010). Social commitment in and for the region has an impact on self-esteem, the development of capacity and self-efficacy, the experience of approval, and finally on health-related aspects of lifestyle (Nebelung et al. 2010; Mackereth and Appleton, 2008). Thus, interventions that nurture and improve social ties might lead to better health outcomes, especially among persons with a low SES in deprived regions.

Several methodological aspects of our study need to be discussed. The sample size of the used data set is not large enough to systematically analyse gender differences in the association of SES, social relations and self-rated health in a longitudinal perspective, as changes in self-rated health over a 5-year period are relatively small. Respective analyses yielded inconsistent results concerning differences between women and men (not shown in the tables). We are aware that there are gender differences in self-reported health, social relations and inequality indicators as well as in their associations (Matthews et al. 1999; Bambra et al. 2009; Melchior et al. 2003; Turner and Marino 1994). Therefore, it is necessary to consider gender differences in future research when sufficient statistical power and/or a longer observation period are provided.

Furthermore, the instrument measuring social support cannot be regarded as sufficiently validated as the instrument originally consists of 19 items (Sherbourne and Stewart 1991). In the SHIP-Study, only five items were available (Baumeister et al. 2004) which must be considered a limitation. This holds especially true for the measurement of emotional support with only one item because in the original scale emotional support was regarded as a construct covering different aspects (Sherbourne and Stewart 1991). However, our analyses reveal a satisfactory reliability (Cronbach's Alpha = 0.89) for the four items measuring instrumental support. Generally, the measurement of social relations' functional aspects is more difficult than of structural aspects, which could explain in part why the study reveals a weaker mediating role of functional aspect of social relations on the association between SES and self-rated health.

Moreover, we refer to self-reported data only. Therefore, a possible bias cannot be excluded. Data of social relations

at follow-up were not available. Thus, a potential reverse effect of poor self-rated health at baseline on poor social relations at follow-up could not be investigated. Due to the scale of our outcome variable, and because we introduced multiple control variables in our regression models we were not able to calculate the significance of the mediating effect.

One strength of our study is its prospective design. Furthermore, the study includes different substantial aspects of social relations, social support and social networks, for analysing their explanatory contribution concerning health inequalities. Moreover, the assessment of social networks is based on an established multidimensional instrument (Berkman et al. 2004; Berkman and Syme 1979). The response rate at both waves of data collection is satisfying. Indeed, the sampling procedure took place in a specific area, but the randomised sample stratified by age and gender including an age range between 20 and 81 is not restricted to a special population group, but refers to the general population in this region.

Conclusions

In this prospective study, the association between social inequality (education, equivalent household income and job status) and self-rated health was partly explained by social relations, estimated by the availability of social support and the extent of social networks. The study was conducted in a deprived region which is affected by social change, population decrease, high unemployment and high premature mortality. In such regions, the promotion of both social support and social integration can help to encourage self-efficacy and adaptive coping strategies that can result in better health and well-being of people with low SES, and therefore, can contribute to reduce health inequalities.

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Conflict of interest The authors declare that they have no conflict of interest.

Ethical standards The study was approved by the Ethics Committee of the University of Greifswald and complies with the current laws of the country.

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