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# Associations of income with self-reported ill-health and health resources in a rural community sample of Austria

Summary

**Objectives:** Three levels of health indicators (1) self-reported ill-health, (2) internal health resources, and (3) external health resources were analysed in relation to a four-category household income distribution in order to describe possible social gradients. The particular aim of this study was to obtain information on the association of income data with self-reported ill-health.

**Methods:** This cross-sectional study was based on a health survey. The sample represents around 10 % of the rural population of some communities in Styria, randomly selected from the population registry. Interview data was collected from 3781 participants aged 15 years and older, 1559 males and 2222 females.

**Results:** The results show that individuals from lower household income classes are disadvantaged with regard to indicators of ill-health, internal and external health resources. Overall, the link between low income and poor health is highly consistent within our data.

**Conclusions:** Considering our results we conclude that internal and external health resources are as unequally distributed over income levels as health outcome indicators.

**Key-Words:** Ill-health – Health resources – Income.

## Introduction

The purpose of this paper is to examine the interrelation between income on the one hand and self-reported ill-health, external and internal health resources on the other hand in an Austrian community sample.

Associations between socio-economic status (SES) and health have been identified in many studies[1–14]. Different indicators such as educational level, occupational status and different income variables were used to assess the SES in these studies. Stronks et al.[15] showed associations between low income and poor health. Blaxter[16] reported comparable results in a study using self-assessed health indicators. Low incomes were strongly related to poor health. In her study on health and life style Blaxter[16] was able to demonstrate that income is the most important variable in this association. Wilkinson[17] demonstrated a curvilinear relationship between income and ill-health. He demonstrated a small increase in illness, disease, and poor psycho-social health at the high income end of the scale. As reported there are many studies on health outcome indicators and SES but there is little information available as to the differences in internal and external health resources and their relationship to income. Therefore, we decided to analyse primarily the association of health resources and income.

Disparities in health, related to a person's SES, are explained only in part by biomedical risk factors (such as genetic dispositions, hypertension, hypercholesterolemia, diabetes etc.), poor compliance or lack of access to health care. This is demonstrated in many clinical studies and clinical trials of cardiovascular diseases[18–21], pulmonary diseases[22], neoplastic diseases[23,24], and rheumatic disorders[25].

In the past two decades new concepts of health have been elaborated. Thus perspectives regarding the concept of health have changed from a pathogenic to a salutogenic

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model in social scientific health research[26,27]. This new health concept is based on the assumption that an individual is permanently faced with various kinds of stressors during his/her life. Specific exchange processes between individuals – their cognitive and emotional processes and their strategies of coping – and their environment are assumed to be essential for health. A general orientation guiding health-related actions called sense of coherence (SOC) is assumed to be a necessary condition for positive health. Antonovsky's conception of a SOC suggests a central dimension of personality. This may assist individuals to cope with the many different forms of strain and nevertheless stay healthy. Different generalised resistance resources (e.g., social and economic circumstances, education, social networks) are decisive for the development of a distinct SOC.

Thus, health is embedded in a most complex and dynamic system. Health research involves associations of many complex levels and types of influences affecting health. It is assumed that the character of health has to be seen in the context of systemic feedback processes. This shift of perspective has had a major impact on sociological health concepts. Critically, we have to take into consideration that, generally, multilevel modelling departs from the view that causal relationships can be revealed. Causal modelling goes along with problems of usage and interpretation, e.g., a major problem is the choosing of the model. Causal directions are still open to debate, whether good health resources have effects on health outcome indicators or whether it is the other way around[28].

Mussmann et al.[29] define health as "a transactionally produced condition of a dynamic balance between the individual, his/her autonomous potential of self-organisation, as well as of self-restoration and his/her social and economic environment. This balance depends upon the availability and use of health-protective and health-restoring factors in the individual and in the environment, which can be defined as internal and external resources" (p. 9). These factors represent resources which are essential in coping with strain[30,31].

In this broad approach to health, the individual is influenced by several systems, like organic, psychological, and social systems. Therefore, health results from the capability of the individual to regulate its own behaviour and physiology. The exchange of information on all levels of organisation, from the simple molecular level to the level of social and cultural interactions plays a crucial role in this process[32–34].

We assume that the development and maintenance of positive health depends upon environmental and economic conditions, as well as on the infrastructure of everyday life. Health is the product of successful interaction with the environment; that is, with coping and changing[35].

In this survey health was conceptualised within the framework of a resource model operationalising main levels by different health indicators. These levels (1) self-reported ill-health, (2) internal health resources, and (3) external health resources were analysed in relation to a four-category household income distribution in order to describe possible social gradients.

*Hypotheses and research question*

The following hypotheses are tested to establish the contribution of income inequality to the distribution of health indicators: The level of household income should differentiate the grade of ill-health as well as internal and external health resources. We assume that higher incomes should result in a better health performance, that lower income strata are disadvantaged in relation to the higher income strata. Because there is not much information available concerning the distribution of health resources, this paper focuses on the association of income – which might itself be considered as an external resource – with the levels of subjective ill-health, internal and external health resources. Some studies[36–38] evaluate the association of SES and health resources. For example the SOC, but none of them uses income as an indicator of SES. We do not intend causal modelling of the three main levels (see Fig. 1).

## Methods

*Sample*

This cross-sectional study was based on a health survey. The sample represents around 10% of the rural population of some communities in Styria, randomly selected from the population registry. Addresses of eligible candidates were randomly selected from 19 communities. Eligible survey candidates were non-institutionalised residents aged 15 years and older. Interview data was collected from 3781 participants, 1559 males and 2222 females, who provided a complete dataset for our final statistical analysis. The overall response rate of 90% can be considered very satisfactory. The interviews were carried out by specifically trained graduates of schools of medicine and of behavioural sciences between January 1996 and September 1997. There were two purposes of the survey: psycho-social orientated health monitoring in the communities for a health promotion project and scientific interest in multilevel associations of health.

*Data analysis*

Descriptive statistics, reliability estimates and analyses of covariance were calculated using SPSS[39]. Missing values were excluded pairwise which means that each coefficient is based on all cases that have valid codes on that particular set of variables used in the calculation.

Health indicators were defined by theory-based and internally consistent sets of items. Internal consistency was evaluated by means of Cronbach's alpha coefficient. A Cronbach's alpha greater than 0.50 was accepted as a suitable demonstration of internal consistency. Indicators were set up by summing up the single items of the scale, on the condition that the alpha value exceeded our defined limit. This total score was divided through the number of items comprised in each scale.

Already existing scales were confirmed using factor analyses (principal component analysis, varimax rotation) and reliability analyses. Several new scales were derived by factor analysis (principal component analysis, varimax rotation). If the factor solution turned out to be theoretically sound, Cronbach's alpha was calculated. The indicator of chronic conditions was built as a priori sum index by adding the reported presence of diseases.

*Variables*

We consider all applied indicators as bipolar constructions i.e. as a continuum from resource to demand. The personal interview used for the survey was based on a resource model of health[40,41] and included different levels comprised of the following (all items are listed in the appendix):

Self-reported ill-health: The subjective perception of health status was assessed with one item. Quality of life was operationalised using the Munich Quality of Life Dimension List.[42] This scale measures physical quality of life (2 items, $\alpha = 0.77$) and psychological quality of life (5 items, $\alpha = 0.75$).

Symptoms: twelve frequent symptoms were accounted for in three factors: general, heart, muscles, and skeletal symptoms. We calculated a general indicator for all twelve items ($\alpha = 0.84$)[43]. Frequency of 14 chronic conditions (e.g., myocardial infarction, diabetes mellitus, hypercholesterolemia, cancer, asthma, hypertension, chronic bronchitis, rheumatism) was assessed. Each condition was coded as present (1) or absent (0). We derived the total frequency score by summing up the present chronic conditions (0–14 – sum index).

Internal resources: We operationalised general health behaviour as the potential to stay healthy and resistant (10 items, $\alpha = 0.66$). As a basis for our 8-item SOC scale we used the translation of Noack et al.[44] We developed this short form of the SOC scale in different studies ($\alpha = 0.81$)[45].

External resources: Our survey focused on aspects of practical social support (4 items, $\alpha = 0.72$), social integration (4 items, $\alpha = 0.70$), personal estimation of emotional support (5 items, $\alpha = 0.73$), and overall social support (13 items, $\alpha = 0.79$)[46].

The concept of social support, wide-spread in social scientific health research, refers to the daily situation in which people are embedded in a system of social relationships, through which they consume or give social support.

Sociodemographic parameters assessed were age, gender, and household income. Household income (total of all incomes in one household after tax per month) was assessed as a four-category variable: *grade 1* below 12000 ATS (866 EURO); *grade 2* 12000 ATS – 20000 ATS (866 – 1.444 EURO), *grade 3* 20000 – 30000 ATS (1.444 – 2.166 EURO); *grade 4* more than 30000 ATS (2.166 EURO).

## Results

Separate co-variance analyses were performed for the male sample, the female sample and the total sample. The sex-stratified samples were adjusted for age and the total sample for age and sex. Additionally, we tested a model which included the variable number of household members as a covariate which was assumed to be a confounder of household income. It did not result in different significant effects, thus we omitted the presentation of these analyses. P-values lower than 0.05 were considered as significant differences.

In the male sample, a significant effect appears for variables psychological quality of life and self-assessed general health status, showing that higher incomes are associated with higher values on these health indicators. In terms of physical

| | Income grade 1 (low) N = 463 | Income grade 2 N = 1,170 | Income grade 3 N = 1,196 | Income grade 4 (high) N = 952 |
|---|---|---|---|---|
| Age in years: mean (SD) | 54,77 (20,05) | 45,67 (16,96) | 41,80 (16,38) | 41,16 (16,68) |
| Gender: % female/% male | 67,2/32,8 | 57,8/42,2 | 58,1/41,9 | 56,7/43,3 |

**Table 1** Socio-demographic data

quality of life, there is an upward trend for income strata 1 to 3 while results for income strata 4 drop slightly below strata 3. There are no significant results in symptoms and chronic conditions.

While internal resources SOC and health behaviour show an upward trend again from income strata 1 to 3, strata 4 slightly points downwards. On the other hand, external resources, operationalised as emotional and practical social support, social integration and overall social support, all show a significant trend increasing with higher income.

In the female sample, for the variables psychological quality of life, symptoms, general self-assessed health status, SOC, emotional and practical support, social integration and overall social support, there is a linear trend at the detriment of lower income strata. No statistical significance has been pointed out for variables physical quality of life, chronic conditions and health behaviour.

The total sample shows a significant linear trend in favour of the upper income strata, for variables of levels self-reported ill-health, internal resources and external resources. The only exception appears for chronic conditions where the highest incomes showed a negligibly higher frequency than in the third income strata. However, this result also remains statistically significant.

## Discussion

In our cross-sectional study population the association between household income and self-reported ill-health is in line with other survey studies of European countries using such indicators as dependent variables[15,16,47]. Statistically non-significant exceptions of 11 analysed variables were symptoms and chronic conditions in the male sample, and

| Subjective health | Range | Income grade 1 N = 149 | | Income grade 2 N = 498 | | Income grade 3 N = 499 | | Income grade 4 N = 413 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | M | SE | M | SE | M | SE | M | SE | P |
| Health status | 1–6 | 4.54 | 0.073 | 4.59 | 0.040 | 4.73 | 0.040 | 4.78 | 0.044 | 0.001 |
| Physical quality of life (QoL) | 1–5 | 3.77 | 0.062 | 3.82 | 0.034 | 3.94 | 0.034 | 3.91 | 0.037 | 0.017 |
| Psychological QoL | 1–5 | 3.87 | 0.045 | 3.93 | 0.025 | 4.03 | 0.025 | 4.07 | 0.027 | 0.000 |
| Symptoms | 1–5 | 1.91 | 0.052 | 1.86 | 0.028 | 1.80 | 0.028 | 1.82 | 0.031 | 0.192 |
| Chronic conditions | 0–14 | 1.01 | 0.095 | 0.84 | 0.052 | 0.77 | 0.052 | 0.83 | 0.057 | 0.163 |
| Internal health resources | | | | | | | | | | |
| Health behaviour | 1–5 | 3.48 | 0.044 | 3.58 | 0.024 | 3.64 | 0.024 | 3.60 | 0.026 | 0.011 |
| Sense of coherence | 1–7 | 5.66 | 0.071 | 5.69 | 0.039 | 5.88 | 0.039 | 5.80 | 0.043 | 0.002 |
| External health resources | | | | | | | | | | |
| Practical support | 1–5 | 4.36 | 0.049 | 4.58 | 0.027 | 4.65 | 0.027 | 4.67 | 0.030 | 0.000 |
| Social integration | 1–5 | 4.14 | 0.062 | 4.20 | 0.035 | 4.23 | 0.034 | 4.33 | 0.038 | 0.025 |
| Emotional support | 1–5 | 4.17 | 0.055 | 4.34 | 0.031 | 4.41 | 0.030 | 4.41 | 0.033 | 0.001 |
| Overall social support | 1–5 | 4.22 | 0.046 | 4.37 | 0.026 | 4.43 | 0.025 | 4.46 | 0.028 | 0.000 |

Income grade 1 = low income, income grade 4 = high income.
In all variables a higher value indicates better health or more resources with the exception of symptoms and chronic conditions.

**Table 2** Male subsample: health and income; adjusted for age

| Subjective health | Range | Income grade 1 N = 314 | | Income grade 2 N = 672 | | Income grade 3 N = 697 | | Income grade 4 N = 539 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | M | SE | M | SE | M | SE | M | SE | P |
| Health status | 1–6 | 4.57 | 0.053 | 4.72 | 0.035 | 4.76 | 0.034 | 4.76 | 0.039 | 0.017 |
| Physical quality of life (QoL) | 1–5 | 3.77 | 0.046 | 3.88 | 0.030 | 3.87 | 0.030 | 3.87 | 0.034 | 0.180 |
| Psychological QoL | 1–5 | 3.86 | 0.034 | 3.95 | 0.023 | 3.99 | 0.022 | 4.03 | 0.025 | 0.001 |
| Symptoms | 1–5 | 2.09 | 0.039 | 1.94 | 0.026 | 1.93 | 0.025 | 1.89 | 0.029 | 0.001 |
| Chronic conditions | 0–14 | 1.09 | 0.108 | 1.00 | 0.071 | 0.84 | 0.070 | 0.82 | 0.080 | 0.103 |
| Internal health resources | | | | | | | | | | |
| Health behaviour | 1–5 | 3.75 | 0.030 | 3.83 | 0.020 | 3.80 | 0.020 | 3.82 | 0.022 | 0.210 |
| Sense of coherence | 1–7 | 5.51 | 0.056 | 5.63 | 0.037 | 5.65 | 0.036 | 5.72 | 0.041 | 0.033 |
| External health resources | | | | | | | | | | |
| Practical support | 1–5 | 4.47 | 0.032 | 4.69 | 0.021 | 4.73 | 0.021 | 4.73 | 0.024 | 0.000 |
| Social integration | 1–5 | 4.10 | 0.044 | 4.31 | 0.029 | 4.31 | 0.029 | 4.37 | 0.033 | 0.000 |
| Emotional support | 1–5 | 4.42 | 0.033 | 4.57 | 0.022 | 4.58 | 0.022 | 4.59 | 0.025 | 0.000 |
| Overall social support | 1–5 | 4.34 | 0.030 | 4.53 | 0.020 | 4.54 | 0.020 | 4.56 | 0.022 | 0.000 |

Income grade 1 = low income, income grade 4 = high income.
In all variables a higher value indicates better health or more resources with the exception of symptoms and chronic conditions.

**Table 3** Female subsample: health and income; adjusted for age

| Subjective health | Range | Income grade 1 N = 463 | | Income grade 2 N = 1,170 | | Income grade 3 N = 1,196 | | Income grade 4 N = 952 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | M | SE | M | SE | M | SE | M | SE | P |
| Health status | 1–6 | 4.56 | 0.043 | 4.66 | 0.026 | 4.75 | 0.026 | 4.77 | 0.029 | 0.000 |
| Physical quality of life (QoL) | 1–5 | 3.78 | 0.037 | 3.85 | 0.023 | 3.89 | 0.022 | 3.89 | 0.025 | 0.035 |
| Psychological QoL | 1–5 | 3.86 | 0.027 | 3.94 | 0.017 | 4.01 | 0.017 | 4.05 | 0.019 | 0.000 |
| Symptoms | 1–5 | 2.03 | 0.031 | 1.91 | 0.019 | 1.87 | 0.019 | 1.86 | 0.021 | 0.000 |
| Chronic conditions | 0–14 | 1.07 | 0.076 | 0.94 | 0.047 | 0.81 | 0.046 | 0.82 | 0.052 | 0.014 |
| Internal health resources | | | | | | | | | | |
| Health behaviour | 1–5 | 3.64 | 0.025 | 3.72 | 0.015 | 3.73 | 0.015 | 3.73 | 0.017 | 0.006 |
| Sense of coherence | 1–7 | 5.57 | 0.044 | 5.65 | 0.027 | 5.74 | 0.027 | 5.75 | 0.030 | 0.001 |
| External health resources | | | | | | | | | | |
| Practical support | 1–5 | 4.43 | 0.027 | 4.64 | 0.017 | 4.70 | 0.017 | 4.71 | 0.019 | 0.000 |
| Social integration | 1–5 | 4.11 | 0.036 | 4.27 | 0.022 | 4.28 | 0.022 | 4.35 | 0.025 | 0.000 |
| Emotional support | 1–5 | 4.31 | 0.029 | 4.48 | 0.018 | 4.51 | 0.018 | 4.51 | 0.020 | 0.000 |
| Overall social support | 1–5 | 4.29 | 0.025 | 4.47 | 0.016 | 4.50 | 0.016 | 4.52 | 0.017 | 0.000 |

Income grade 1 = low income, income grade 4 = high income.
In all variables a higher value indicates better health or more resources with the exception of symptoms and chronic conditions.

**Table 4** Total sample: health and income; adjusted for age and sex

physical quality of life, chronic conditions, and general health behaviour in the female sample. The total sample analysis reported only significant results. Our analyses displayed a linear trend of health disadvantages for the lower household income classes. Considering the variables physical quality of life, SOC, and general health behaviour in males as well as chronic conditions in the total sample, the highest income strata reported a slightly worse health status than the third highest income strata. This could be explained by either higher sensitivity for symptoms or by factual higher stress in the upper income classes. Overall, the link between income and poor health is highly consistent within our data.

In an analysis on health and life style Blaxter[16] reported higher risks of problems for low income groups than for low occupation groups while controlling for differences in other socio-economic indicators. She concluded that "apparently strong association of social class and health is primarily an association of income and health" (p. 72). Considering the link between income and material possessions, these results indicate that material wealth is more important in the explanation of inequalities in health than behavioural determinants. However, the pathways through which income distribution impacts health, and additionally, distinguishing between confounders and factors in the causal pathway, are still a matter of debate.

As there is little information available as to mediating factors in this pathway we included internal and external health resources in addition to health outcome measures. In this study paper we did not intend to establish a causal modelling approach but to describe hypothesised mediating factors in relation to the income distribution. There are no studies on the difference of SOC between income strata. Some studies use other SES indicators such as education or occupation. These studies indicate that the SOC[36], social support[48], and health behaviour[49,50] may be factors involved as mediators between SES and health. Further research would be needed for the certain explanation of the causal direction[28]. We consider the significant linear trend of the SOC and all indicators of social support demonstrated in our analyses as an important result and a further contribution to this discussion. Considering the given results of our analysis we concluded that internal and external health resources are as unequally distributed over income levels as health outcome indicators. This lends support to the theory of a resource model of health as a useful framework for understanding the multilevel interrelations of health and furthermore that the hypothesised causal direction of our model (see Fig. 1) might be correct. The next step for future research should therefore establish health resources as mediators between socio-economic and health outcome indicators in order to get information on causal pathways[51–53].

Lay concepts of health provide the basis for answering the items of this survey. Lay concepts may affect considerations of the reliability or the meaning of answers to questions from which the measures are constructed. On the other hand there are some aspects which support the usefulness of self-assessed health indicators. In the minds of people health is not an unitary concept. It includes parts of a biomedical definition and considers health also a subjective state. This permits individuals to provide information about symptoms, states of feeling and the capacity to perform roles which only they can give. Self-defined health has been shown to be a good predictor of mortality and to be important in aspects of coping with major illness[54,55].

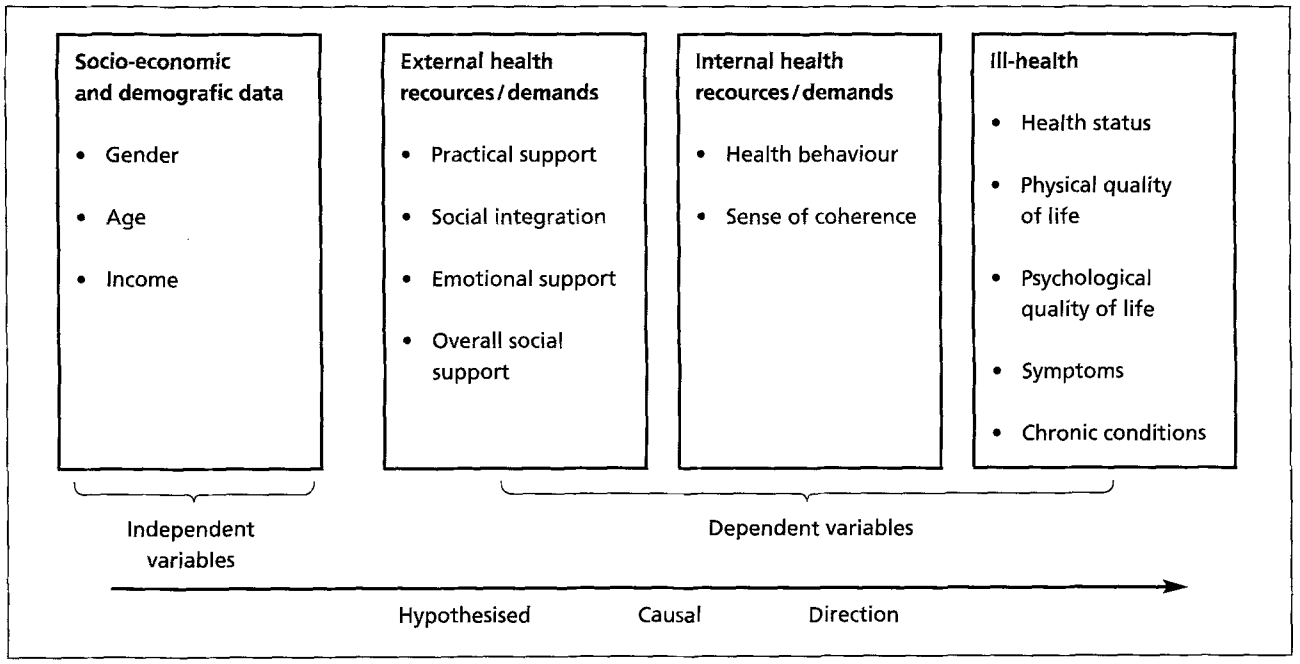


**Figure 1** Levels and health indicators of a demand – resource model of health

Concerning generalisability or external validity, it cannot be assumed that the study is able to produce unbiased inferences regarding an Austrian target population. As we used a rural population for sampling, presumably results cannot be generalised beyond this sample. The response rate is rather high, but a selection bias cannot be excluded with certainty, although all study participants were randomly selected from the official community register. However, this should not have a major impact on the results, since the study focused on associations and not on being representative for a certain population. Considering that social networks usually work better in rural areas than in big cities, one can assume that social differences in health resources in our rural sample were underestimated rather than overestimated. A possible limitation of the study could be that some psychosocial constructions because of their complexity could be assessed better and in more detail with qualitative research methods.

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Zusammenfassung

**Zusammenhänge von Einkommen mit subjektiver Gesundheit und Gesundheitsressourcen in einer ländlichen Stichprobe Österreichs**

**Fragestellung:** In der vorliegenden Studie wurden die Zusammenhänge zwischen Indikatoren subjektiver Gesundheit und externen und internen Gesundheitsressourcen (Anforderungs-Ressourcenmodell) mit dem Haushaltseinkommen untersucht.

**Methoden:** Die Daten basieren auf einer ca. 10-prozentigen Zufallsstichprobe von Personen im Alter von 15 Jahren aufwärts. Im Rahmen dieser Querschnittserhebung wurden 3781 Personen, 1559 Männer und 2222 Frauen, in ländlichen Gemeinden der Steiermark (Österreich) mittels eines strukturierten Interviews befragt.

**Resultate:** Die Ergebnisse verdeutlichen einen sehr konsistenten Zusammenhang zwischen niedrigerem Einkommen und einer schlechteren subjektiven Gesundheit.

**Schlussfolgerungen:** Überdies muss bemerkenswerterweise festgehalten werden, dass ein solcher Zusammenhang in vergleichbarer Stärke auch für interne und externe Gesundheitsressourcen existiert.

Résumé

**Répercutions du revenu sur la santé subjective et les ressources de santé étudiées dans un échantillon rural autrichien**

**Objectives:** L'étude présente se propose d'analyser les rapports des indicateurs de santé subjective et des ressources de santé externes et internes (modèle de ressources) avec le revenu des ménages.

**Méthodes:** Les données se basent sur un échantillon aléatoire de 10% réalisé sur des personnes âgées de 15 ans et plus. Au cours de ce sondage, 3781 personnes, dont 1559 hommes et 2222 femmes, habitants des communes rurales styriennes (Autriche), ont été questionnées durant des entrevues à structure préalablement définie.

**Résultats:** Les résultats révèlent une corrélation très nette entre les revenus modérés et la réduction de la santé subjective.

**Conclusions:** Une telle corrélation existe épaliments entre les revenus et les ressources de santé internes et externes.

## References

1 *Antonovsky A.* Social class and the major cardiovascular diseases. J Chron Dis 1968; *21:* 65–106.

2 *Guralnik JM, Kaplan GA.* Predictors of healthy aging: prospective evidence from the Alameda County Study. Am J Public Health 1989; *79:* 703–8.

3 *Pincus T, Callahan LF.* Associations of low formal education level and poor health status: behavioral, in addition to demographic and medical explanations? J Clin Epidemiol 1994; *4:* 355–61.

4 *Townsend P, Davidson N.* Inequalities in health: the Black report. London: Penguin Books, 1988.

5 *Blaxter M.* Evidence of inequality in health from a national survey. Lancet 1987; *2:* 30–3.

6 *Dahl E.* Social inequalities in ill-health: the significance of occupational status, education and income – results from a Norwegian survey. Sociol Health Ill 1994; *16:* 644–67.

7 *Östberg V.* The social pattering of child mortality: the importance of social class, gender, family structure, immigrant status and population density. Sociol Health Ill 1997; *19:* 415–35.

8 *Dennis BH, Zhukovsky GS, Shestov DB,* et al. The association of education with coronary heart disease mortality in the USSR Lipid Research Clinics Study. Int J Epidemiol 1993; *22:* 420–7.

9 *Araki S, Murata K.* Social life factors affecting the mortality of total Japanese population. Soc Sci Med 1986; *23:* 1163–9.

10 *Siskind V, Coperman R, Najman JM.* Socioeconomic status and mortality: a Brisbane area analysis. Community Health Stud 1987; *11:* 15–23.

11 *Minder CE.* Socio-economic factors and mortality in Switzerland. Soz Praventivmed 1993; *38:* 313–28.

12 *Helmert U, Mielck A, Classen E.* Social inequities in cardiovascular risk factors in East and West Germany. Soc Sci Med 1992; *35:* 1283–92.

13 *Stronegger WJ, Freidl W, Rásky É.* Health behaviour and risk behaviour: socioeconomic differences in an Austrian rural county. Soc Sci Med 1997; *44:* 423–6.

14 *Wennemo I.* Infant mortality, public policy and inequality – a comparison of 18 industrialised countries 1950–85. Sociol Health Ill 1993; *15:* 430–46.

15 *Stronks K, Vab de Mheen H, Van den Bos J, Mackenbach JP.* The interrelationship between income, health and employment status. Int J Epidemiol 1997; *26:* 592–600.

16 *Blaxter M.* Health and lifestyles. London; New York: Tavistock; Routledge, 1990.

17 *Wilkinson RG.* Class and health: research and longitudinal data. London: Tavistock, 1986.

18 *Ruberman W, Weinblatt E, Goldberg JD, Chaudhary BS.* Education, psychosocial stress and sudden cardiac death. J Chron Dis 1983; *36:* 151–60.

19 *Ruberman W, Weinblatt E, Goldberg JD, Chaudhary BS.* Psychosocial influences on mortality after myocardial infarction. N Engl J Med 1984; *311:* 552–9.

20 *Marmot MG, Kogevinas M, Elston MA.* Social/economic status and disease. Ann Rev Public Health 1987; *8:* 111–35.

21 *Matthews KA, Kelsey F, Meilahn EN, Kuller LH, Wing RR.* Educational attainment and behavioral and biologic risk factors for coronary heart disease in middle-aged women. Am J Epidemiol 1989; *129:* 1132–44.

22 *Greenberg ER, Chute CG, Stukel R,* et al. Social and economic factors in the choice of lung cancer treatment. N Engl J Med 1988; *318:* 612–7.

23 *Farley TA, Flannery JT.* Late-stage diagnosis of breast cancer in women of lower socioeconomic status: public health implications. Am J Public Health 1989; *79:* 1508–12.

24 *Kogevinas M, Marmot MG, Fox AJ, Goldblatt PO.* Socioeconomic differences in cancer survival. J Epidemiol Community Health 1991; *45:* 216–9.

25 *Callahan LF, Smith WJ, Pincus T.* Self-report questionnaires in five rheumatic diseases: comparisons of health status constructs and associations with formal education level. Arthritis Care Res 1989; *2:* 122–31.

26 *Antonovsky A.* Health, stress, and coping. San Francisco; Washington; London: Jossey-Bass, 1979.

27 *Antonovsky A.* Unraveling the mystery of health: how people manage stress and stay well. San Francisco; Washington; London: Jossey-Bass, 1987.

28 *Geyer S.* Some conceptual considerations on the sense of coherence. Soc Sci Med 1997; *44:* 1771–9.

29 *Mussmann C, Kraft U, Thalmann K, Muheim M.* Die Gesundheit gesunder Personen, Forschungsprojekt SALUTE Bericht Nr. 2. ETH Zürich: Institut für Arbeitspsychologie, 1993.

30 *Lazarus RS, Folkman S.* Stress, appraisal, and coping. Berlin; Heidelberg; New York: Springer, 1984.

31 *Lazarus RS.* Emotion and adaptation. New York; Oxford: Oxford University Press, 1991.

Soz.- Präventivmed. 46 (2001) 106–114

32 *Weiner H.* Auf dem Weg zu einem integrierten biomedizinischen Modell: Folgerungen für die Theorie der psychosomatischen Medizin. Psychother Psychosom Med Psychol 1990; *40:* 81–101.

33 *Weiner H.* Der Organismus als leib-seelische Funktionseinheit: Folgerungen für eine psychosomatische Medizin. Psychother Psychosom Med Psychol 1991; *41:* 465–81.

34 *Noack RH.* Concepts of health and health promotion. In: Abelin T, Brzezinski ZJ, Carstairs VDL, eds. Measurement in health promotion and protection. Copenhagen: WHO, Regional Office for Europe, 1987: 5–28.

35 *Breitwieser U, Donauer B, Elsigan G, Grossmann R.* Gesundheitsförderung: Appelle sind zuwenig: Beispiele regionaler Bildungsarbeit. München: Profil, 1990.

36 *Lundberg O.* Childhood conditions, sense of coherence, social class and adult ill health: exploring their theoretical and empirical relations. Soc Sci Med 1997; *44:* 821–31.

37 *Lundberg O, Nyström Peck M.* Sense of coherence, social structure and health. Evidence from population survey in Sweden. Eur J Public Health 1994; *4:* 252–7.

38 *Poppius E, Tenkanen L, Kalimo R, Heinsalmi P.* The sense of coherence and occupation and the risk of coronary heart disease in the Helsinki Heart Study. Soc Sci Med 1999; *49:* 109–20.

39 SPSS Advanced Statistics User's Guide. Chicago: SPSS Inc., 1990.

40 *Freidl W.* The impact of anomia as a factor in a demand resource model of health. Soc Sci Med 1997; *44:* 1357–65.

41 *Freidl W, Rásky É, Stronegger WJ.* Operationalisation of a demand/resource model of health: an explorative study. J Epidemiol Commun Health 1999; *53:* 187–8.

42 *Bullinger M, Ludwig M, Steinbüchel N.* Lebensqualität bei kardiovaskulären Erkrankungen: Grundlagen, Messverfahren und Ergebnisse. Göttingen: Hogrefe, 1991.

43 *Calmonte R, Nakamura Y, Noack H.* Messinstrumente im Härz-As-Projekt: Gesundheitsinterview, Fragebogen und Gesundheitsindikatoren: AGF-Projektbericht 1993. Bern: Institut für Sozial- und Präventivmedizin, 1993.

44 *Noack RH, Bachmann N, Olivieri M, Kopp HG, Udris I.* Sense of Coherence Questionnaire: authorized German translation. Graz, Austria: Institut für Sozialmedizin, KF-University, 1991.

45 *Freidl W, Noack RH, Neuhold C.* Development of an 8-item short version of the sense of coherence (SOC) scale for health surveys: the 13th Conference of the European Health Psychology Society, Florence, October 1999. Book of Abstracts, p. 160.

46 *Sommer G, Fydrich T.* Soziale Unterstützung: Diagnostik, Konzepte. Fragebogen zur sozialen Unterstützung. Tübingen: Deutsche Gesellschaft für Verhaltenstherapie, 1988. (F-SOZU, Materialien Nr. 22).

47 *Aiach P, Curtis S.* Social inequalities in self-reported morbidity: interpretation and comparison of data from Britain and France. Soc Sci Med 1990; *31:* 267–74.

48 *Kaplan GA.* Where do shared pathways lead? Some reflections on a research agenda. Psychosom Med 1995; *57:* 208–12.

49 *Wray LA, Herzog AR, Willis RJ, Wallace RB.* The impact of education and heart attack on smoking cessation among middle-aged adults. J Health Soc Behav 1998; *39:* 271–94.

50 *Rásky É, Stronegger WJ, Freidl W.* Die Verteilung von ausgewählten kardialen Risikofaktoren bei erwerbstätigen und lernenden Jugendlichen in ländlichen Regionen der Steiermark. Soz Praventivmed 1996; *41:* 348–58.

51 *Marmot MG, Smith GD.* Socio-economic differentials in health. J Health Psychol 1997; *2:* 283–96.

52 *Williams DR, Yu Y, Jackson JS, Anderson NB.* Racial differences in physical and mental health. J Health Psychol 1997; *2:* 335–51.

53 *Chamberlain K.* Socio-economic health differentials: from structure to experience. J Health Psychol 1997; *2:* 399–411.

54 *Singer E, Garfinkel R, Cohen SM, Srole L.* Mortality and mental health: evidence from the Midtown Manhattan Restudy. Soc Sci Med 1976; *10:* 517–25.

55 *Hunt SM, Mc Kenna SP, McEwen J, Backett EM, Williams J, Papp E.* A quantitative approach to perceived health status: a validation study. J Epidemiol Community Health 1980; *34:* 281–6.

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## Appendix

**Items of the scales**

**Subjective perception of health status**
Item:
*How would you rate your general state of health?*
Response categories provided: very good – very poor (1 item, 6-point rating scale)

**Quality of life**
Items:
*The following questions refer to how satisfied you are with various aspects of your life in general.*
*Physical performance (physical quality of life)*
*Personal well-being (psychological)*
*Sense of self-worth (psychological)*
*Ability to relax (psychological)*
*Success and appreciation (psychological)*
*Physical health (physical)*
*Life in general (psychological)*
Response categories provided: very satisfied – not at all satisfied (5-point ratings)

**Symptoms**
Items:
*How often during the last twelve months did you have ...*
*Headache*
*Racing heart with little physical effort*
*Shortage of breath with little physical effort*
*Sensitive stomach*
*Pain in neck or shoulder*
*Pain in back*
*Nervousness, inner restlessness*
*Pain or sensation of pressure in chest*
*Lack of concentration*
*Difficulties going to sleep or wakefulness during the night*
*General weakness or lack of energy during the day*
*Pain in joints or extremities*
Response categories provided: almost daily/every few days/every few weeks /every few months/(virtually) never

**General health behaviour**
Items:
*To stay healthy, you may do various things actively or avoid certain things. What about you: what do you do conscienciously or actively to stay healthy?*
*I practise some form of sports*
*I go outdoors (hiking, walking)*
*I relax (lay down, rest)*
*I go to the doctor's for a general check-up*
*I take care of myself and look after myself*
*I try to get enough sleep*
*I keep in touch with friends and acquaintances*
*I try not to be stressed and avoid anger*
*I don't drink any or only a little alcohol*
*I try to eat healthy food*
Response categories provided: almost daily – (virtually) never (5-point ratings).

**8-item SOC scale**
Items:
*Do you have the feeling that you're being treated unfairly?*
*Do you have the feeling that you are in an unfamiliar situation and don't know what to do?*
*Do you have very mixed-up feelings and ideas?*
*Does it happen that you have feelings inside you would rather not feel?*
*Many people – even those with a strong character – sometimes feel like sad sacks (losers) in certain situations. How often have you felt this way in the past?*
*How often do you have the feeling that there's little meaning in the things you do in your daily life?*
*How often do you have feelings that you're not sure you can keep under control?*
*Doing the things you do every day is a source ... of deep pleasure and satisfaction (response category = 1) ... a source of pain and boredom (response category = 7).*
Response categories provided for items 1 – 7: 1 = yes very much so, very often; 4 = to some extent, sometimes; 7 = not at all, very seldom or never (7-point ratings)

**Social support**
Items:
*Here are some statements about relationships. Please indicate if and to what extent these affirmations apply to you.*
*There are people who take me as I am (emotional support)*
*My friends/family appreciate my opinion on certain things (social integration)*
*I have friends/relatives who are able to listen if I want to talk (emotional support)*
*I hardly know anybody with whom I would like to go for a drink (social integration)*
*I have friends/relatives who sometimes simply give me a hug (emotional support)*
*If I am depressed I know who to go to (emotional support)*
*I have a person close to me whose company I really enjoy (emotional support)*
*There is a circle of people which I feel part of (social integration)*
*My friends often give me valuable tips (e.g. good doctor, important information) (social integration)*
*I have someone to look after my flat (flowers, pets) when I'm not there (practical support)*
*If necessary, there is someone from whom I can borrow tools or food (practical support)*
*When I'm ill, I can always ask friends / relatives to help me out with important things (e.g. shopping) (practical support)*
*I know enough people who really help me when I'm stuck (practical support)*
Response categories provided: does not apply at all – applies totally (5-point-ratings)