Quality of life among reindeer-herding Sami

ORIGINAL ARTICLE

QUALITY OF LIFE IN RELATION TO PHYSICAL, PSYCHOSOCIAL AND SOCIO-ECONOMIC CONDITIONS AMONG REINDEER-HERDING SAMI

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ABSTRACT

Objectives. To analyse different aspects of health-related quality of life factors among members of reindeer-herding families.

Study design. Cross-sectional study based on data from a comprehensive survey.

Methods. The health-related quality of life (SF-36) factors were analysed on 99 (6 men, 43 women) adult members of reindeer-herding families. Comparisons were made between the reindeer-herding family members and a Swedish reference population. Associations between mental and physical component summary measures and a number of sociodemographic, biomedical, physical, psychosocial and socio-economic variables were analysed with multivariate regression statistics.

Results. Men scored higher than women on physical and social function and vitality. The average scores on the subscales for the reindeer-herding family members were similar to those of the Swedish reference population, except for reindeer-herding men who scored higher on physical function and lower on bodily pain. For women, the quality of life was related to age, sense of coherence, lifestyle and behavioural variables, as well as to issues such as diseases among close relatives, social networks and the economy of their business. For men, it was mainly related to musculoskeletal pain conditions, age, sense of coherence and physical and psychosocial working conditions.

Conclusions. Men and women of the reindeer-herding families need partly different conditions to enjoy a high quality of life. From the results, it might be predicted that poor somatic and psychosocial health, increased intrusion from exploiters on the grazing land and declining profit in reindeer husbandry constitute important threats to a good quality of life among members of reindeer-herding families. (Int J Circumpolar Health 2008; 67(1):8-26)

Keywords: Sami, reindeer herding, quality of life, psychosocial health, somatic health, socio-economy
INTRODUCTION

In Sweden, the right to breed and herd reindeer for commercial purposes is restricted to people of Sami origin. There are approximately 2,000 Sami in the country who live in families where reindeer herding is a major source of income (1,2). The reindeer-herding communities have experienced dramatic changes over the last decades. Reindeer herding has been transformed from being the core of the nomadic Sami lifestyle to a fully commercialised small family businesses organised in specific Sami communities (samebyar in Swedish). Today, reindeer husbandry is extensively motorised and most of the herding families live in the same village all year around (3,4). Reduced profitability and increased pressure from society to use the traditional reindeer grazing land for other purposes (e.g., mining, forestry, energy production) have most probably had a negative impact on the quality of life experienced by the reindeer-herding Sami. However, up to now the quality of life has never been studied among the reindeer-herding Sami of Sweden.

The quality of life may be indirectly assessed by analysing socio-economic variables such as income, education, housing conditions and possession of cars, computers, etc. More direct methods of gaining information on how people experience their quality of life are based on interviews and questionnaires (5–7). One of the most frequently used questionnaires is the SF-36, which assesses the physical and mental components related to the quality of life. The SF-36 has demonstrated its high validity and reliability in a large variety of contexts, for example, in studies on the quality of life in different nationalities, ethnic groups and professions, as well as in evaluations of the impact of different diseases and treatment methods (8–14).

The results presented in this paper are part of the data acquired in a comprehensive health and work environment survey performed in 7 reindeer-herding communities in Sweden between 2003 and 2006. The survey focused on work-related diseases, symptoms and risk factors, and included a large amount of sociodemographic, biomedical, clinical physical, psychosocial and socio-economic data.

The main objective of the present study was to analyse different aspects of health-related quality of life among adult members of reindeer-herding families. It was considered particularly interesting to compare the quality of life reported by reindeer-herding men and women, and to relate these data to comparable data from the general Swedish population. Another aim was to explore relations between the quality of life reported by reindeer-herding men and women, respectively, and a large number of sociodemographic, biomedical, physical, psychosocial and socio-economic variables.

MATERIAL AND METHODS

The study was approved by the regional ethics committee and conformed to the principles of the Declaration of Helsinki, the International Ethical Guidelines for Biomedical Research Involving Human subjects and the International Guidelines for ethical review for epidemiological studies.
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Subjects
The data presented in this paper emanate from a health and work environment survey executed in collaboration with 7 reindeer-herding communities (i.e., samebyar). The communities were selected from different parts of Sweden (i.e., 1 from the County of Jämtland, 2 from the County of Västerbotten and 4 from the County of Norrbotten). The inclusion criteria were the similarity regarding the number of community members and the number of reindeer per family company.

The survey was restricted to adult (age ≥18 years) community members living in households where at least 1 of the members was occupied in reindeer herding throughout the year. This restriction implies that the survey embraced only those community members who were most heavily exposed to the reindeer-herding occupation and lifestyle. Out of a total of about 345 adult members in the 7 communities, 154 met this condition. After being given information about the survey’s objectives, methods and time schedule, 7 of the members decided not to participate. After two remainders, 99 (67.3%) of the 147 members completed the SF-36 questionnaire on health-related quality of life. Age and gender distribution, together with sociodemographic characteristics of the study population, are shown in Table I.

Assessment of quality of life
The SF-36 was used to assess health-related quality of life (5,15). The physically related quality of life was evaluated through the indices physical function (PF), role-physical (RP), bodily pain (BP) and general health (GH), while the mental components related to the quality of life were analysed through the indices vitality (VT), social function (SF),

| Table I. Sociodemographic characteristics of the study population. |
|---------------------------------------------------------------------|
| **Men** n=56 | **Women** n=43 |
| **Age, years (mean±SD)** | 44±15 | 42±14 |
| **Age, range (years)** | 22–76 | 18–73 |
| **Occupation** | | |
| Reindeer herding, full time | 41 (73%) | 0 |
| Other occupation, full time | 0 | 15 (35%) |
| Reindeer herding in combination with other occupations, full time | 6 (11%) | 22 (51%) |
| Reindeer herding in combination with retirement | 7 (13%) | 4 (9%) |
| Unknown | 2 (4%) | 2 (5%) |
| **Household status** | | |
| Living alone | 5 (9%) | 1 (2%) |
| Cohabiting with adult/adults only | 15 (27%) | 11 (26%) |
| Cohabiting with adult/adults and child/children | 25 (45%) | 28 (65%) |
| Cohabiting with child/children only | 0 | 0 |
| Unknown | 11 (20%) | 3 (7%) |
| **Highest level of education** | | |
| Compulsory (6–9 years) | 28 (50%) | 6 (14%) |
| Upper secondary (10–12 years) | 17 (30%) | 25 (58%) |
| University (≥13 years) | 2 (4%) | 9 (21%) |
| Unknown | 9 (16%) | 3 (7%) |
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Variables included in the regression analyses

The relations between the MCS and the PCS, respectively, and a total of 465 variables were analysed by aid of a multivariate regression method (see Statistical analyses). A brief description of the variables included in these analyses is given below.

Sociodemography: Information on age, occupation, employment, sick leave, marital and household status, and education were obtained from an extensive questionnaire developed by the County Council of Västerbotten in order to enable longitudinal evaluations of a regional intervention program for the prevention of cardiovascular diseases and diabetes (16,17). In addition to sociodemographic data, the questionnaire covered items related to disease heredity, life-style and risk behaviour (see below). These sociodemographic data were complemented by information about which county the reindeer-herding communities were located in and whether their grazing land was located in the woodlands all year around (Skogssamebyar) or if the herds were moved between grazing lands in the mountains and woodlands (Fjällsamebyar). A total of 9 sociodemographic variables were included in the regression analyses.

Biomedical data: During extensive medical health examinations, performed by experienced GPs and nurses at local health care centres near the reindeer-herding communities, the following biomedical data were documented: body mass index, waist-hip ratio, total cholesterol, LDL-cholesterol, HDL-cholesterol, triglycerides, ferrous and thyroid status, blood pressure, as well as the results of an oral glucose loading test, spirometry test, allergy test and an audiometry. A total of 19 biomedical variables were included in the regression analyses.

Behaviour and life-style: Data on diet, alcohol, smoking and physical activity were extracted from 2 questionnaires, 1 developed by the County Council of Västerbotten to enable longitudinal evaluations of an intervention program for the prevention of cardiovascular disease and diabetes (see above, sociodemography) and 1 developed by the Swedish National Board of Health and Welfare to evaluate socio-economic conditions in reindeer husbandry (see below, socio-economy). A total of 63 variables covered how often various foods and drinks were consumed, 8 variables focused on alcohol habits, 6 on tobacco habits and 6 on physical activity.

Other health indicators: From the questionnaire developed by the County Council of Västerbotten (see above, sociodemography), a total of 30 questions on different health indicators were included in the regression analyses. The questions comprised issues such as the general health condition over the last year, family history of cardiovascular disease and diabetes, degree of satisfaction with various physical, social, mental and occupational conditions (e.g., family, work and economy, physical endurance, hearing, memory, sleep, mood, patience and appetite).

Musculoskeletal symptoms: From the standardized Nordic Questionnaire the occurrence, duration and experienced severity of musculoskeletal symptoms were assessed (18).
A total of 22 variables covering the prevalence of musculoskeletal symptoms in 10 body regions over the last week and year, the number of painful body regions and the average pain intensity (in mm on a 100mm-visual analogue scale) over the last week were included in the regression analyses.

The Neck Disability Index was used to assess neck-related disability (19). This is a 10-item questionnaire on pain intensity and how neck pain affected the occurrence of headaches and daily activities such as personal care, lifting, reading, concentration, work, driving, sleeping and recreation. The 10 items were included as separate variables in the regression analyses.

Physical exposure: A 25-item questionnaire was constructed to obtain information on the average annual exposure to different reindeer-herding tasks and physical risk factors. The exposure was estimated as the number of hours a subject was exposed annually to reindeer-herding work during winter and summer, including feeding, slaughter, migration and transportation, patrolling, gathering and separation, labelling reindeer calves, maintenance of fences and buildings; as well as physical activities of driving a car, snowmobile, four-wheel terrain vehicle or motocross bike; being exposed to dusty and noisy working conditions; going fishing and hunting; doing paper work; working in static body postures; working with statically rotated head, flexed back, flexed knees or arms above the shoulders. All 25 items were included in the regression analyses.

Accidents: A questionnaire on the occurrence of accidents was constructed to acquire data on whether the herders had been involved in accidents that caused physical injuries.

Three types of accidents were specifically asked for: traffic accidents on roads, vehicle accidents off-roads and accidents related to herding activities such as reindeer gathering and slaughter and the operation of tools and equipment. These three items were included in the regression analyses.

Psychosocial exposure: From the questionnaire developed by the County Council of Västerbotten (see above, sociodemography), 16 questions on social network and emotional support were included in the regression analyses. Items covered by these questions were the size and level of satisfaction with the social network (6 questions), qualities of the emotional support (7 questions) and engagement in societies or groups other than family and working colleagues (3 questions).

The psychosocial exposure related to the working conditions was assessed through 3 different questionnaires. Job strain was measured according to Karasek’s demand-control model (20). The questionnaire contained 5 items about psychological job demands, 4 on intellectual discretion and 2 on control over work. All 11 items were separately included in the regression analyses.

Siegrist’s effort-reward imbalance questionnaire was applied to assess adverse health effects of stressful experiences at work (21). The questionnaire included 17 statements, and for each of them the respondent was to assess the degree of agreement and to what extent this condition affected the respondent. The statements were constructed to measure reward in terms of status control (e.g., promotion prospects and job insecurity) in relation to extrinsic (e.g., work pressure) or intrinsic effort (e.g., need for control). All 34 items were separately included in the regression analyses.
A questionnaire was constructed to obtain information on psychosocial factors related to the specific work organisation used in the reindeer-herding communities. The items in this questionnaire were focused on personal relations, decision making, decision latitude, decision support, communications, democratic principles, others appreciation of ones opinions and efforts, distribution of work load, and extent and type of collaborations. In all, this questionnaire contained 66 variables. All were included in the regression analyses.

Sense of coherence: The sense of coherence was assessed by Antonovsky’s 13-question Sense of Coherence Scale (22). The questionnaire contained questions on comprehensibility, manageability and meaningfulness. All of them were separately included in the regression analyses.

Socio-economy: To evaluate the socio-economic conditions, a modified version of a questionnaire constructed by the Swedish Ministry of Agriculture and Statistics Sweden to obtain socio-economic data from reindeer-herding companies (23) was applied. The questionnaire contained 124 questions on the economy of the reindeer-herding companies (e.g., sources and size of incomes, expenses, investments, size of their herds, number and types of vehicles), the family and the community; on how future alterations in economic, environmental and societal conditions were believed to influence the reindeer-herding activities; and on the opinions regarding competences important for future prosperity. All 124 questions were used as individual variables in the regression analyses.

Most of the questionnaires applied in the study are widely used and have been shown to be of acceptable validity and reliability (15–23). However, the questionnaires constructed by ourselves to explore physical exposure, accidents and work organisation have not yet been tested for validity and reliability.

To improve the response rate, the questionnaires were sent to the participants in 2 separate mailings, approximately 6 months apart. Each mailing was followed by 2 reminders.

**Statistical analyses**

One-way analysis of variance was used for statistical comparisons of the SF-36 results obtained from men and women in the reindeer-herding households. Since the Levene’s test for equality of group variances showed that the distribution assumption was not satisfied, the Welch statistic was applied to test for the equality of group means (Table II). P-values lower than 0.05 were considered as significant.

To compare the SF-36 scores obtained from the reindeer herders with those reported from the general Swedish population, the mean score and 95% confidence intervals were calculated for men and women separately for each of the eight subscales (Fig. 1). The Swedish reference data, which are based on 8,930 individuals, are described in detail elsewhere (8,15).

To explore relations between the MCS and the PCS, and the sociodemographic, biomedical, physical, psychosocial, socio-economic, and behaviour/life-style variables, a multivariate regression method was applied, that is, the Orthogonal Projections to Latent Structures (O-PLS). PLS statistics have several advantages in comparison with traditional regression methods, for example, they enable analyses of strongly correlated (collinear) and noisy data, permit numerous predictors and categorical as well as continues data and reduce the risk for type I and II errors. For these reasons,
PLS methods have become standard statistical tools in explorative research concerned with analyses and interpretation of complex data structures, such as in chemistry, bioengineering and psychology. Although PLS statistics are described in detail elsewhere (24-29), a short description of their main features are given below.

The O-PLS is a regression extension of the principal component analysis where the variables are modelled in 2 separate blocks (X and Y). To find systematic patterns of variance in the X block (predictor variables) that correlate to any systematic patterns in the Y block (response variables: in the present analyses, MCS or PCS), the 2 blocks are compared by means of a least square procedure.

The relative contribution of each X variable to the O-PLS model is expressed as a VIP value (Variable Influence on Projection), and a VIP value larger than 1.0 is considered as significant, while values below 0.5 are regarded as non-significant (27). In the present analyses, X variables with a VIP value larger than 1.0, and with the lower limit of its 95% confidence interval above 0.5, were considered as significant for the model. Positive and negative relations between significant X variables and the SF-6 component summary measures were determined by Spearman’s rho.

The explained variance (R²) was calculated for each O-PLS model. A measure of goodness of prediction (Q²), indicating the predictive power of the model, was provided by a cross-validation procedure where parts of the data were fitted iteratively to predict the error of the unfitted part (29). The risk for incorporating random noise in the model (i.e., overfitting) was thereby estimated. Cross-validation was also used to determine the number of extracted components to be included in the final models, as well as in the calculation of the confidence intervals of the VIP values (24,27).

In the present analyses, the MCS and the PCS, calculated separately for men and women, were used as Y variables, while the 465 variables on sociodemographic, economy, biomedical status, physical and psychosocial exposure and behaviour/life-style were used as X variables. All models were performed on mean-centred, scaled and log-transformed data (27). If the variance in a variable was null or close to null, it was considered trivial and, subsequently, removed from the model. Similarly, variables and subjects with more than 50% missing values were excluded from the models.

All statistics was calculated using the SPSS (version 11.5, SPSS Inc., USA), except for the O-PLS analyses which were performed by aid of SIMCA-P (version 11.0, Umetrics, Sweden).

RESULTS

Comparison of men and women in reindeer-herding households
Table II shows, separately for men and women, the mean value and standard deviation for each of the 8 SF-36 subscales and for the 2 summary measures. The mean values for men and women were rather similar regarding the scores on the RF, BP and GH scales, and on the PCS. For the PF, VT, SF, RE and MH scales, as well as for the MCS, the men scored on average higher than the women. However, the one-way analysis of variance indicated significant gender differences on the PF scale only, and close to significant differences on the VT and SF scales.
Comparison of reindeer herders and the general Swedish population

In the general Swedish population, men scored significantly higher than women on all 8 subscales (8,15). The average scores among the reindeer-herding family members were rather similar to those of the Swedish reference population (Fig. 1). There were some notable differences, though. As deemed from the mean values and the 95% confidence intervals, the reindeer-herding men scored higher on the PF scale, but lower on the BP and RE scales.

Table II. Mean values and standard deviations (SD) for the 8 SF-36 subscales and the physical (PCS) and mental (MCS) component summary measures, separately shown for men (n=56) and women (n=43) of reindeer-herding families. Welch statistics and p-values of one-way analysis of variance.

| SF-36                     | Men     | SD   | Women    | SD   | Welch | p     |
|---------------------------|---------|------|----------|------|-------|-------|
| Physical function (PF)    | 94.1    | 8.0  | 88.6     | 14.5 | 4.13  | 0.047 |
| Roll-physical (RF)        | 80.2    | 35.3 | 81.3     | 30.1 | 0.02  | 0.885 |
| Bodily pain (BP)          | 69.1    | 21.0 | 67.9     | 20.7 | 0.08  | 0.784 |
| General health (GH)       | 73.6    | 18.9 | 72.9     | 20.0 | 0.03  | 0.864 |
| Vitality (VT)             | 70.7    | 18.1 | 61.9     | 23.8 | 3.43  | 0.069 |
| Social function (SF)      | 88.3    | 16.1 | 79.6     | 22.9 | 3.84  | 0.055 |
| Roll-emotional (RE)       | 80.5    | 32.2 | 73.2     | 37.3 | 0.91  | 0.345 |
| Mental health (MH)        | 81.8    | 15.5 | 76.7     | 20.2 | 1.63  | 0.206 |
| PCS                       | 50.1    | 7.6  | 49.6     | 9.1  | 0.07  | 0.792 |
| MCS                       | 49.0    | 8.8  | 44.7     | 14.3 | 2.60  | 0.113 |

Figure 1. Mean values and 95% confidence intervals for the 8 SF-36 subscales, separately illustrated for men and women of reindeer-herding families and the Swedish reference population. PF, physical functioning; RP, role-physical; BP, bodily pain; GH, general health; VT, vitality; SF, social functioning; RE, role-emotional; MH, mental health.
There were also trends towards lower scores on the SF and RE scales among the women of the reindeer-herding families.

**Relations between SF-36 summary measures and other variables**

Four O-PLS models were calculated, one for each combination of gender and summary measure (MCS and PCS). After exclusion of individuals with too many missing values in the X block, and of X variables with insufficient variance or too much missing data, the models were based on 32–47 individuals and on 390–399 X variables (Table III). In the 4 models, between 4.4% and 7.7% of the variance in the X block (R2 in X) was used to explain 74–79% of the variance in the PCS and MCS (R2 in Y). This means that only 4.4–7.7% of the socio-demographic, biomedical, physical, psychosocial, socio-economic and behaviour/life-style variables used as X variables were related to the SF-36 summary measures. Yet these rather few X variables explained a great deal of the variance in the PCS and MCS. The goodness of prediction (Q2) was high for the MCS models but low for the PCS models, indicating that the PCS models were overfitted (i.e., random noise was incorporated into the models). Thus, the predictive capacity was good for the MCS models, acceptable for the men’s PCS model and poor for the women’s PCS model. While 3 of the models were statistically significant, the PCS model of the women was not (i.e., indicating a lack of associations between the predictor variables and the women’s physical quality of life).

Table IV shows VIP values (the larger VIP value, the more important for the model), together with the direction of the relationships observed between the X variables and the MCS, for the 33 and 47 significant variables of the MCS models for women and men, respectively. Eleven variables were significant in both models, indicating that these were important issues for the mental quality of life both among women and men in the reindeer-herding families. Most of these variables were related to self-reported health indicators such as the assessment of one’s general health condition over the last year, satisfaction with one’s working condition, as well as one’s mood, energy and emotions.

The variables that were exclusively significant for the women’s MCS model dealt with

| Table III. Summary of 4 O-PLS models where SF-36 physical (PCS) and mental (MCS) component summary measures were used as Y variables. |
|-----------------------------------------------|
| O-PLS model | n | X | R2 in X | R2 in Y | Q2 | Sign |
|-----------------------------------------------|
| Men | | | | | | |
| PCS | 42 | 399 | 0.044 | 0.770 | 0.081 | R1 |
| MCS | 47 | 399 | 0.069 | 0.742 | 0.424 | R1 |
| Women | | | | | | |
| PCS | 32 | 390 | 0.060 | 0.776 | -0.044 | NS |
| MCS | 35 | 388 | 0.077 | 0.791 | 0.285 | R1 |

n=number of subjects
X=number of X variables
R2 in X=proportion of the variance in the X matrix that is utilized for calculation of Y
R2 in Y=explained variance in Y (goodness of fit)
Q2=predictive capacity (goodness of prediction)
Sign=significant (R1) or non-significant (NS) model
issues such as diet, alcohol consumption, cholesterol, family history of cardiovascular disease and diabetes, social networks and the economy of their business (Table IV). Age was also positively associated to the MCS among women, which probably explains the positive relations between MCS and the variables: knee pain last week, and neck pain affecting the capacity to lift and read. Thus, women with high MCS scores seem to be older; seldom have refreshing drinks such as juice, beer and wine; have close relatives with cardiovascular disease and diabetes; are happy with their mood and energy; have an extensive network of close friends; and are satisfied with their work since it provides them with an income and is close to nature. These women are also optimistic about their own ability to control the profitability of their reindeer-herding business and feel positive that they could establish new reindeer-herding companies in their communities if the size of the current reindeer herds were to decrease.

The MCS model for the men was to a large extent based on musculoskeletal pain conditions and on physical and psychosocial working conditions (Table IV). Men with high MCS scores appear to have few musculoskeletal pain problems and being less exposed to physical risk factors. A strong feeling of importance at work, satisfaction with their work organisation and collegial support seem to characterise men who experience good mental health. They are also positive about the future profitability of the reindeer-herding business and would reduce the number of reindeer slaughtered if the meat prices were to decrease. They show a high degree of emotional management together with a high sense of meaningfulness. They seek information and inspiration from reindeer-herding colleagues rather than from newspapers and journals, and they don’t feel awkward about their alcohol habits.

Table V shows VIP values, together with the direction of the relationships between the X variables and the PCS, for the 32 significant variables of the PCS model for men. Most of these variables were related to life-style and behavioural issues, but some related to physical and psychosocial working conditions. Men with high PCS scores seem to be hard working reindeer herders characterized by young age, a secondary school education, frequent exercise and low hip-waist ratio. They more often eat fish, beans and peas and use butter and margarine on their bread, but they seldom include sausage as a major component of a meal. Moreover, these men regard their health as good and reported few incidences of headaches and low back pain over the past week, in spite of the fact that they are heavily exposed to physical risk factors in terms of long hours on snowmobiles, motor cycles and four wheel terrain vehicles during the patrolling and gathering of their reindeer herds. On the socio-economic issues, they believe that tourism, but not a general societal expansion, will causes disturbances in reindeer husbandry in the future, and they don’t think it would be right to reduce the reindeer herds proportionally in all companies of the community if a general reduction in herds would be necessary.
Table IV. Significant variables in the O-PLS models on the SF-36 mental component summary measure, separately shown for men and women of reindeer-herding families. Variable influences on the projections (VIP) and positive and negative correlations (Spearman’s rho) between the mental component summary measure and the X variables are shown.

| X variable | Women | Correl. | VIP | Correl. | Men |
|------------|-------|---------|-----|---------|-----|
| **Sociodemography** |       |         |     |         |     |
| Age (years) | 2.098 | +       |     |         |     |
| Biomedical data |       |         |     |         |     |
| LDL-cholesterol (mmol/l) | 1.725 | +       |     |         |     |
| Total cholesterol (mmol/l) | 1.694 | +       |     |         |     |
| **Diet and alcohol** |       |         |     |         |     |
| How often do you eat sweets or chocolate? | 1.826 | -       |     |         |     |
| 9 response alternatives from never to ≥4 times a day |       |         |     |         |     |
| How often do you drink refreshing drinks or juice? | 1.748 | -       |     |         |     |
| 9 response alternatives from never to ≥4 times a day |       |         |     |         |     |
| How often do you drink coffee? | 1.587 | +       |     |         |     |
| 9 response alternatives from never to ≥4 times a day |       |         |     |         |     |
| How often do you drink beer? | 1.980 | -       |     |         |     |
| 9 response alternatives from never to ≥4 times a day |       |         |     |         |     |
| How often do you drink wine? | 2.220 | -       |     |         |     |
| 9 response alternatives from never to ≥4 times a day |       |         |     |         |     |
| Have you ever felt awkward about your alcohol habits? | 1.462 | +       |     |         |     |
| Response alternatives yes/no |       |         |     |         |     |
| **Other health indicators** |       |         |     |         |     |
| Estimate your general health condition over the last year? | 2.125 | +       |     | 2.402 | +       |
| 5 response alternatives from very bad to good |       |         |     |         |     |
| Have any of your parents or siblings had a heart infarction or stroke before 60 years of age? | 1.719 | -       |     |         |     |
| Response alternatives yes, no and don’t know |       |         |     |         |     |
| Do any of your parents or siblings have diabetes? | 1.493 | -       |     |         |     |
| Response alternatives yes, no and don’t know |       |         |     |         |     |
| How satisfied are you with your work situation? | 1.477 | +       |     | 2.149 | +       |
| 7 response alternatives from very bad to excellent |       |         |     |         |     |
| How satisfied are you with your leisure time? | 1.703 | +       |     |         |     |
| 7 response alternatives from very bad to excellent |       |         |     |         |     |
| How is your mood right now? | 2.595 | +       |     | 2.256 | +       |
| 7 response alternatives from very bad to excellent |       |         |     |         |     |
| How is your perception of your energy right now? | 2.816 | +       |     | 2.770 | +       |
| 7 response alternatives from very bad to excellent |       |         |     |         |     |
| How is your patience right now? | 2.318 | +       |     |         |     |
| 7 response alternatives from very bad to excellent |       |         |     |         |     |
| Do you sleep well at night? | 2.069 | +       |     |         |     |
| 7 response alternatives from very bad to excellent |       |         |     |         |     |
| Do you feel important at work? | 1.610 | +       |     |         |     |
| 7 response alternatives from very bad to excellent |       |         |     |         |     |
| **Musculoskeletal symptoms** |       |         |     |         |     |
| Number of pain regions. Response alternatives from 1 to 10 | 2.467 | -       |     |         |     |
| Did you have neck pain, ache or discomfort during the last 7 days? | 2.421 | -       |     |         |     |
| Response alternatives no/yes |       |         |     |         |     |
| Did you have upper-back pain, ache or discomfort during the last 7 days? | 2.136 | -       |     |         |     |
| Response alternatives no/yes |       |         |     |         |     |
| Did you have low-back pain, ache or discomfort during the last 7 days? | 1.756 | -       |     |         |     |
| Response alternatives no/yes |       |         |     |         |     |
| Did you have knee pain, ache or discomfort during the last 7 days? | 1.663 | -       |     |         |     |
| Response alternatives no/yes |       |         |     |         |     |

Table IV continues on next page
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| X variable | Women VIP | Correl. | Men VIP | Correl. |
|------------|-----------|---------|---------|---------|
| Did you have foot pain, ache or discomfort during the last 7 days? | 1.803 + | 2.259 + |
| Response alternatives no/yes | | | |
| Pain intensity. Six response alternatives from worst imaginable to no pain | | | |
| Lifting. 6 response alternatives from cannot lift or carry anything to can lift heavy weights without pain | 1.743 - | 2.046 + |
| Reading. 6 response alternatives from cannot read at all to can read as much as I want to without pain | 1.802 - | | |
| Work. 6 response alternatives from cannot do any work at all to as much work as I want to | | 2.159 + | |
| Physical exposure | | | |
| Exposure to static postures with rotated neck. Hours/year | 1.905 - | | |
| Exposure to static postures with flexed back. Hours/year | 1.268 - | | |
| Exposure to static sitting postures. Hours/year | 1.793 - | | |
| Accidents | | | |
| Have you had any harmful accidents during reindeer-herding work. | 2.914 - | | |
| Response alternatives no/yes | | | |
| Psychosocial exposure | | | |
| How many close friends do you have? | 1.312 + | | |
| 6 response alternatives from 0 to ≥15 | | | |
| Is your work physically exhausting? | 1.814 - | | |
| 4 response alternatives from often to never | | | |
| Can you leave your work for a moment and talk to a colleague? | 1.689 - | | |
| 4 response alternatives from yes, in most cases to no, it is impossible | | | |
| How do you deem the personal relations in your Sami community? | 1.943 + | | |
| 5 response alternatives from enemies to good friends | | | |
| The personal relations in your Sami community is characterised by: | | | |
| Alternatives no/yes | | | |
| gossiping | 1.738 - | 2.264 - |
| intrigues | 1.280 - | | |
| competition | 1.565 - | | |
| can't stand each other | 1.565 - | | |
| Is there any work leader in your community? | 1.848 - | | |
| Response alternatives no/yes | | | |
| How do you regard the communication between the work leader and the reindeer herders? | 2.273 + | | |
| 4 response alternatives from could be improved to good | | | |
| Do you plan the work together in an atmosphere where everyone can express one's opinion? | | | |
| Alternatives no/yes | | | |
| How much of the reindeer-herding work is decided by the work leader? | 1.840 + | | |
| 5 alternatives from nothing to everything | | | |
| How many persons are invited to discussions of important decisions? | 1.270 - | | |
| 5 alternatives from one person to everybody | | | |
| How is the reindeer-herding work distributed among the herders? | 2.089 + | | |
| 5 alternatives from one to everybody | | | |
| is working together | 1.153 + | | |
| How isolated are you at work? | | | |
| 5 alternatives from isolated to always co-operating with others | 1.874 + | | |
| My chances to promotion are bad. | | | |
| 4 alternatives on degree of influence, from not at all to significantly | 1.815 - | | |

Table IV continues on next page
Quality of life among reindeer-herding Sami

Table IV continues from previous page

| X variable                                                                 | Women VIP | Correl. | VIP Correl. | Men VIP | Correl. |
|---------------------------------------------------------------------------|-----------|---------|-------------|---------|---------|
| **Sense of coherence**                                                    |           |         |             |         |         |
| Do you feel that you don't really care what's going on around you?        |           |         |             |         |         |
| 7 response alternatives from very seldom or never to very often           | 2.001     | -       |             |         |         |
| Has it happened that you were surprised by the behaviour of people whom you know well? |           |         |             |         |         |
| 7 response alternatives from never happened to always happened           | 1.963     | -       |             |         |         |
| Do you have the feeling that you are in an unfamiliar situation and don't know what to do? |           |         |             |         |         |
| 7 response alternatives from very seldom or never to very often           | 2.030     | -       |             |         |         |
| Are your daily activities a source of happiness or boredom?              |           |         |             |         |         |
| 7 response alternatives from a source of pleasure and satisfaction to a source of pain and boredom | 2.163     | -       | 2.070       |         | -       |
| Do you often have contradictory feelings and thinking?                    |           |         |             |         |         |
| 7 response alternatives from seldom or never to very often                | 2.285     | -       | 1.938       |         | -       |
| Does it happen that you have emotions that you don't appreciate?          |           |         |             |         |         |
| 7 response alternatives from seldom or never to very often                | 2.908     | -       | 2.043       |         | -       |
| How often do you feel unlucky in life?                                    |           |         |             |         |         |
| 7 response alternatives from never to very often                          | 2.89      | -       | 2.245       |         | -       |
| How often do you have a feeling that there's little meaning of things you do in daily life? |           |         |             |         |         |
| 7 response alternatives from very seldom or never to very often           | 2.855     | -       | 1.794       |         | -       |
| How often do you have emotions that you can't control?                   |           |         |             |         |         |
| 7 response alternatives from very seldom or never to very often           | 2.465     | -       |             |         |         |
| **Socio-economy**                                                        |           |         |             |         |         |
| Why did you choose to be reindeer herder? It provides an income.          |           |         |             |         |         |
| 6 response alternatives from don't agree to agree completely              | 1.571     | +       |             |         |         |
| What is the advantage of being a reindeer herder? It is close to nature.  |           |         |             |         |         |
| 6 response alternatives from don't agree to agree completely              | 1.167     | +       |             |         |         |
| What is the disadvantage of being a reindeer herder?                      |           |         |             |         |         |
| Dependent on other land users.                                            |           |         |             |         |         |
| 6 response alternatives from don't agree to agree completely              | 1.644     | -       |             |         |         |
| From where do you get your professional knowledge and inspiration?       |           |         |             |         |         |
| Newspapers, journals, advertising brochures.                             | 1.564     | -       |             |         |         |
| From where do you get your professional knowledge and inspiration?       |           |         |             |         |         |
| Other reindeer herders.                                                   |           |         |             |         |         |
| 6 response alternatives from not at all to very much                      | 2.127     | +       |             |         |         |
| If you were about to expand your knowledge, what would be important?     |           |         |             |         |         |
| Negotiating technique based on legislation.                               | 1.173     | -       |             |         |         |
| 6 response alternatives from not important to very important             |           |         |             |         |         |
| What will influence the profitability in your reindeer-herding company in the long run? Your own decisions. |           |         |             |         |         |
| 6 response alternatives from not at all to very much                      | 1.981     | +       |             |         |         |
| How do you expect the economic profitability to change over the next 5 years? | 1.792     | +       |             |         |         |
| 5 response alternatives from decrease a lot to increase a lot             |           |         |             |         |         |
| If the price on reindeer meat was reduced by 10%, how would you change your harvest? | 1.577     | -       |             |         |         |
| 4 response alternatives, decrease the harvest, unchanged, increase the harvest and I don't know |           |         |             |         |         |
| What do you think the Sami community should do if the number of reindeer drops? New reindeer-herding companies should be established. | 1.882     | +       |             |         |         |
| 6 response alternatives from don't agree to agree completely              |           |         |             |         |         |
| How much of your own consumption of meat originates from game hunting. Response in kilos/year | 1.825     | -       |             |         |         |
Table V. Significant variables in the O-PLS model on the SF-36 physical component summary measure for reindeer-herding men. Variable influences on the projections (VIP) and positive and negative correlations (Spearman’s rho) between the physical component summary measure and the X variables are shown.

| X variable                                  | VIP  | Correl. |
|---------------------------------------------|------|---------|
| **Sociodemography**                         |      |         |
| Age (years)                                 | 2.337| -       |
| Engagement in reindeer-herding work.        | 2.175| +       |
| Mountain or forest community                | 1.417| +       |
| Level of education?                         |      |         |
| 9 response alternatives from elementary school only to long academic education | 1.627| +       |
| **Biomedical data**                         |      |         |
| Allergy. Positive skin prick tests.         | 1.432| +       |
| Waist-hip ratio                             | 1.694| -       |
| **Diet and alcohol**                        |      |         |
| How often do you eat butter on bread?       |      |         |
| 9 response alternatives from never to ≥4 times a day | 1.480| +       |
| How often do you eat margarine on bread?    |      |         |
| 9 response alternatives from never to ≥4 times a day | 1.860| +       |
| How often do you use margarine in cooking?  |      |         |
| 9 response alternatives from never to ≥4 times a day | 1.508| -       |
| How often do you eat buns and biscuits?     |      |         |
| 9 response alternatives from never to ≥4 times a day | 1.742| +       |
| How often do you eat beans and peas?        |      |         |
| 9 response alternatives from never to ≥4 times a day | 1.554| +       |
| How often do you eat sausage for dinner?    |      |         |
| 9 response alternatives from never to ≥4 times a day | 1.094| -       |
| How often do you eat fish? 9 response alternatives from never to ≥4 times a day | 1.765| +       |
| How often do you drink refreshing drinks or juice? |      |         |
| 9 response alternatives from never to ≥4 times a day | 2.336| +       |
| **Other health indicators**                 |      |         |
| Estimate your general health condition over the last year? | 2.906| +       |
| 5 response alternatives from very bad to good |      |         |
| How often do you exercise to improve your endurance? | 2.211| +       |
| 5 response alternatives from never to ≥3 times a week |      |         |
| **Musculoskeletal symptoms**                |      |         |
| Did you have a headache during the last 7 days? Response alternatives no/yes | 1.575| -       |
| Did you have low-back pain, ache or discomfort during the last 7 days? |      |         |
| Response alternatives no/yes                | 1.405| -       |
| **Physical exposure**                       |      |         |
| Is your daily work physically exhausting? Response alternatives no/yes | 1.685| +       |
| Hunting. Hours/year                         | 2.174| +       |
| Patrolling reindeer herds. Hours/year       | 1.834| +       |
| Snow-mobile. Hours/year                     | 2.519| +       |
| Four wheel terrain vehicle. Hours/year      | 1.761| +       |
| Motor cycle                                 | 1.694| +       |
| **Psychosocial exposure**                   |      |         |
| The personal relations in your Sami community are characterised by? Alternatives no/yes | 1.353| +       |
| information is efficiently spread between working colleagues | |         |
| working colleagues are listening to each other | 1.714| +       |
| working colleagues enjoy each others company | 1.409| +       |
| How much of the board work is taken care of by the chairman of the community board? | 2.255| +       |
| 5 response alternatives from nothing to everything |      |         |

Table V continues on next page
## DISCUSSION

The present study indicates that the health-related quality of life among Swedish reindeer-herding Sami is quite similar to that of the general Swedish population. Yet small but significant differences between the reindeer-herding family members and the Swedish reference data were found for some of the SF-36 subscales. The reindeer-herding men reported higher scores on the physical functioning and lower scores on the bodily pain scale as compared with men in the Swedish reference population, while the reindeer-herding women showed slightly lower scores on the social functioning and role-emotional scales as compared with the average Swedish women. The comparison between men and women of the reindeer-herding families suggests that the men were more satisfied with the quality of life related to physical function, social function and role-emotional. On the summery measures, the physical component scores were virtually identical for men and women, while the mental component measure was lower among the women. These findings, together with the results obtained from the multivariate regression analyses, support the conclusion that men and women of reindeer-herding households need partly different conditions to enjoy a high quality of life.

### Methodological considerations

The data of the present study are based on a rather small and selected sample of reindeer-herding family members, which suggests that the results are not representative for the Swedish reindeer herders as a whole. In the survey from which the data were collected, the main objective was to increase the knowledge on work-related health and diseases among the reindeer-herding Sami. To obtain data permitting analyses of complex relations between the reindeer-herders’ work and lifestyles and their health and well-being, it was deemed important to extract a wide variety of data from each individual rather than acquire a limited quantity of data from a large cohort. The study population was therefore selected

### Table V continues from previous page

| X variable                                                                 | VIP | Correl. |
|---------------------------------------------------------------------------|-----|---------|
| My chances for promotion are bad. 4 alternatives on degree of influence,  | 2.178 | -       |
| from not at all to significantly                                         |     |         |
| **Socio-economy**                                                        |     |         |
| How do you expect your reindeer-herding company to be influenced by      | 1.500 | +       |
| tourism over the next 5 years?                                            |     |         |
| 5 response alternatives from decrease a lot to increase a lot             |     |         |
| How do you expect your reindeer-herding company to be influenced by      | 1.127 | -       |
| the general societal expansion over the next 5 years?                     |     |         |
| 5 response alternatives from less influences to influences a lot         |     |         |
| What do you think the Sami community should do if the number of         | 1.863 | -       |
| reindeer becomes too large? All reindeer-herding companies should reduce their herds proportionally. 6 response alternatives from don’t agree to agree completely |     |         |
to represent those who were highly exposed to the reindeer-herding occupation and life-style. Thus, we believe that the results presented in this study are representative for the approximately 1,000 adult members of Swedish reindeer-herding families in which reindeer husbandry is the most important source of income and basis for their lifestyle (cf. Table I).

The SF-36 questionnaire has been used in studies of quality of life on a number of different ethnic groups (8,9,11,12). Although only minor deviations related to ethnicity were observed, it has been stressed that caution should be taken when the outcome from different ethnic groups is compared (9). For instance, it is quite likely that ethnocultural origin and language have significant effects on how various questions and response alternatives are interpreted. To what extent this is the case among the Sami is not known, but it would certainly be interesting to explore this in future qualitative studies.

In spite of the seemingly large variety of X variables included in the multivariate regression analyses, the quality of life in the physical domain was rather poorly predicted. This was particularly apparent for the women’s PCS model which was non-significant (Table III). The most conceivable reason for this is that other factors than those included in the analyses have an important association with the physical quality of life. Factors such as collective ethnocultural values and attitudes, individual identities and value systems and a number of physical and medical conditions were not at all, or only sparsely, incorporated into the analyses. The poor PCS model for the reindeer-herding women might also be explained by their pronounced heterogeneity regarding factors such as working conditions, level of education and exposure to Sami and Swedish cultures (cf. Table I).

**Conditions related to quality of life**

A cross-sectional study design does not allow any conclusions on the causality between associated variables. Nonetheless, the regression analyses of the present study revealed a number of sociodemographic, biomedical, physical, psychosocial and socio-economic conditions that were strongly related to the quality of life reported by the reindeer-herding family members. Based on these relationships, it is possible to identify conditions connected to the experiences of good and poor health-related quality of life.

The mental components related to quality of life were associated with a wide range of different variables. For both women and men of the reindeer-herding families, the MCS was positively related to the self-appreciated health condition, the degree of satisfaction with the daily work and with one’s mood and energy. Moreover, for both men and women, several of the items determining the sense of coherence were significantly related to the MCS (Table IV).

However, the most striking finding of the regression analyses was the large number of variables that were exclusively related to the men’s or women’s assessment of their mental quality of life. While the model for men to a large extent was based on musculoskeletal pain and on physical and psychosocial working conditions, the model for women was mainly shaped by age, life-style and behavioural variables and issues such as diseases among close relatives, social
networks and the economics of their business (Table IV). Thus, men and women of the reindeer-herding households appear to need partly different conditions and environments to enjoy a high quality of life. For instance, those women who demonstrated a high quality of life found satisfaction with their reindeer husbandry which appears to be linked to its nearness to nature and its economic profitability. For men, on the other hand, the reindeer-herding work seems to be more important as a life-style in a cultural context where skilled and successful herders enjoy the highest respect and status (2,30). Another interesting difference was that high quality of life among men was related to a generally positive attitude towards the future profitability of their reindeer husbandries, whereas among women it was associated with their own possibility of controlling the profitability. The latter might be a reflection of the women’s growing responsibility for the economic situation of the reindeer-herding families in combination with the declining profitability of reindeer husbandry. Since the 1990s, the women’s income, largely earned from employment outside the reindeer-herding communities, has contributed to more than 50% of the total family income (30).

The mental components related to the quality of life among women was significantly influenced by age, that is, age was positively related to MCS, suggesting that younger women have a more disadvantaged mental health component factoring into their quality of life than the older women. This is probably related to the younger women’s high level of responsibility, which include work in the reindeer husbandry (e.g., administration, provision of food supplements to the reindeer, processing of reindeer meat and skin), responsibility for the household and children, upholding of the family's social network and employment outside the Sami community to secure a decent family income. With such obligations it is not surprising that women of reindeer-herding families have been found to experience low levels of intellectual discretion, decision latitude and social support (31).

The physically related quality of life among men was associated with variables such as age, physical condition and diet. Those who reported a high quality of life in this respect seem to work extensively as herders (e.g., long hours on snowmobiles, motor cycles and four wheel terrain vehicles during patrolling and gathering) without suffering from impeding musculoskeletal pain conditions (Table V). Several of these men were young, ambitious and in the process of establishing a reindeer-herding business of their own.

Based on the results of the present study, it might be predicted that the increasing intrusion from exploiters, such as mining, forestry and power plant companies, will reduce the quality of life among the reindeer-herding families, in particular if the reindeer-herding communities are left without real possibilities to influence the size and location of their the grazing land. This will affect the sense of coherence negatively by decreasing the experience of comprehensibility and manageability (22). Another factor that certainly will hamper the quality of life is declining somatic health conditions. This has been partly indicated in recent studies on the incidences of cancer, cardiovascular disease and musculoskeletal pain conditions.
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(2-30–33). Thus, health promoting services that are suitably adapted to the specific health problems and risk factors related to the reindeer-herding occupation and life-style are necessary prerequisites for a good quality of life among the reindeer-herding Sami. Yet the most important threats to the quality of life among the reindeer-herding families are probably the declining profitability of their reindeer husbandries and the psychosocial strain caused by the continuous competition over grazing land.

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