

The SF-36 questionnaire and its usefulness in population studies: results of the German Health Interview and Examination Survey 1998

Summary

Objectives: To describe the distribution and the relationships of the SF-36 scales in a representative sample of the German population.

Methods: The German National Health Interview and Examination Survey 1998 comprised 7 124 participants aged 18 to 79 years and included the Short Form 36 Questionnaire (SF-36). The 1998 findings are compared to those of the first normative German SF-36 sample from 1994.

Results: Older people (≥ 65 years) in particular have increased the mean scale values for quality-of-life assessment during the four years. The average of all SF-36 scales increases with the social status of the individual in all age categories. The representative sample shows a more positive subjective assessment of their quality-of-life by East Germans in nearly all scales of SF-36, although they do not have a correspondingly better health status. The intensity of pain and the number of diseases during the preceding year are shown to decrease the life quality scales. Furthermore the General Health scale of SF-36 is correlated with the physicians' consultation.

Conclusion: The instrument to assess quality-of-life can generate useful information for a wide variety of variables. However, future health-related quality-of-life measurements in healthy population should be more sensitive and more differentiating than the SF-36 instruments.

Keywords: Health-related quality-of-life – SF-36 – General population – Health status assessment – National Health Interview and Examination Survey.

^a formerly Bellach.

The Short Form 36 questionnaire was newly introduced into the German Health Interview and Examination Survey 1998 with the intention to measure health related quality-of-life (HRQOL) for a representative sample of the German adult population. The SF-36 was selected because it is the most commonly used and validated instrument for measuring HRQOL for which comparable data in Europe (for example Jenkinson et al. 1994; Lamarca et al. 2001; Persson et al. 1998) and in the USA exist. Nevertheless it was not clear if this instrument would be useful at the population level since it was originally designed to assess the results of therapy in patients.

The fact that the German health survey includes information about morbidity, life style, eating habits, satisfaction, social relations, sociodemographic parameters like education, income, profession, and health care consumption allows a deeper evaluation of the features of the SF-36 questionnaire. By analysing the complex interdependence between morbidity, health-related behaviours, and quality-of-life the possibilities and limitations of HRQOL measurements at the population level can be assessed.

In addition, the answers to the SF-36 in this survey provide a recent SF-36 normative population sample that can be compared with the 1994 normative sample.

Materials and methods

Population and sample recruitment

The first Health Survey in the reunified Germany was carried out between October 1997 and March 1999. A representative sample of the non-institutionalised adult residential German population aged between 18 and 79 years was taken. The first step of the two stage sampling procedure was to take a representative sample (with regard to size)

from the German communities. To ensure regional comparability between East and West Germany, a disproportional design was selected: 80 sample points were randomly chosen in West Germany and 40 sample points in East Germany (former GDR). In the second step a random sample of residents aged between 18 and 79 was selected from the official resident's registries of those communities. The procedure for inviting the randomly selected inhabitants is precisely described in Thefeld et al. 1999. In total, 7124 residents (4705 from West, 2419 from East Germany) participated in the survey. The response rate was 61.4% and 16.0% of the non-responders filled in a short questionnaire. Therefore, information (albeit partially limited) from 77.4% of the sample was obtained.

The sample also includes foreign nationals living in Germany. For over 15% of the non-respondents it was simply not possible to make personal contact. According to the statement in the short questionnaire and with regard to the important questions of general health status the differences between non-respondents and respondents can be classified as negligible.

The mean age of the participants was 46.1 years. The proportion of female participants (51.4%) was slightly higher than the proportion of males (48.6%) to match the population structure in Germany.

Data collection

The survey respondents were asked to visit a study centre where they completed a self-administered questionnaire. This included questions about the consumption of medical services, health-relevant behaviours (smoking, alcohol use, eating habits, work related distress, physical activity), physical and psycho-social living situation, global ratings of satisfaction related to several aspects of living conditions (Ellert & Knopf 1999), and the prevalence of risk factors and diseases. Following the recommendations of the German Epidemiological Association (DAE) questions concerning social status (education, profession, income) were included (Ahrens et al. 1998). Using the definition of the DAE, 21.6% of the participants belonged to the upper class, 55.6% to the middle class, and 22.2% to the lower class. Further details are published elsewhere (Knopf et al. 1999).

The weight, height, and blood pressure of the participants were measured at the study centre and blood and urine samples were collected. These samples were analysed in a central laboratory at the Robert Koch Institute.

The physician in the study centre asked the participants about their drug consumption, their vaccination status, and their present health status. These interviews were standardised and computer assisted (CAPI).

SF-36 questionnaire

The German version of the SF-36 questionnaire was developed and evaluated within the framework of the project "International Quality of Life Assessment" (IQOLA) (Bullinger et al. 1998; Gandek & Ware 1998). Psychometric validation of the German SF-36 yields comparable results for data completeness, reliability and construct validity with other European samples (Bullinger 1995; Bullinger et al. 1998). The first German normative sample from 1994 (Bullinger & Kirchberger 1998) comprised 2914 subjects, 14 years and older with a mean age of 47.7 years.

The SF-36 questionnaire, which groups 35 items into eight multi-item scales and includes one additional health-change item, was used to collect data on the self-assessed state of health. The eight health concepts are: physical functioning (PF), role-physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role-emotional (RE), and mental health (MH). Following the standard SF-36 scoring (Bullinger 1995; Ware et al. 1993), missing data was replaced by individual estimations per person.

Questions about pain and morbidity

The participants of the study were questioned about the occurrence and localisation of pain during the previous year. In addition they were asked to provide detailed information about any pain during the preceding week. The participants classified the intensity of their pain on a scale of 1 (hardly felt) to 9 (unbearable pain). This short pain questionnaire corresponds to recommendations of German epidemiologists for population surveys (Raspe & Kohlmann 1994).

The survey participants were asked a defined number of diseases. If applicable, the time interval in which the disease occurred was defined as "in the last month", "in the last year" and "not in the last year". Within the framework of a personal interview by the physician they were asked for more details concerning cardiovascular diseases, allergies, diabetes, and other relevant diseases.

Statistical analysis

First, descriptive statistics for the scales of the SF-36 questionnaire were generated, dependent upon age, gender, and East/West distribution and the percentiles, means, and standard deviations calculated for the representative sample. To adjust for deviations in age, gender, community size, and East/West distribution, weights were calculated to ensure that the sample was representative. These weights were employed for all the descriptive statistical analyses.

However, for modelling the relationship between SF-36 scales and some health impact factors samples were

controlled for age, gender, community size, and regional factors, making the use of weights unnecessary.

All statistical analyses were carried out using the statistical software package SPSS 10.0.

Logistic regression models as well as the generalised linear models (GLM) procedure for univariate design have been used.

Results

New normative SF-36 sample

A new German normative population sample was established by subjectively assessing the HRQOL of 6 964 participants. An initial description of this sample is given in Ellert and Bellach (1999). In Tables A1 and A2 of the appendix the percentiles, means, and standard deviations for five-years age groups are given for men and women in Germany. The number of missings in the different items of the SF-36 scales is low in all age groups (about 1%) so that the effect of applying the substitution rule at the individual level would seem to be negligible.

Men and women have different scale profiles, characterised by the average of the SF-36 scales. Women have lower average values in all of the SF-36 scales, with one exception: In the general assessment of their health (GH) the male and female scale averages are similar.

In addition, the scales differ according to age. With increasing age the physical health scales declined at a faster rate than those of mental health. Such scales as social functioning (SF), emotional role (RE) and mental health (MH) seem to be virtually age independent.

Comparison of the 1994 and the 1998 normative sample

Comparing the statistical parameters of the 1994 normative sample (see Bullinger & Kirchberger 1998) with those of 1998 (Tables A1 and A2) reveal only marginal differences between the mean values of the scales. The only exception appears to be the body pain scale (BP). Here a significant decrease in the mean scale value is seen for all age groups of both gender. One explanation can be that the participants had to answer the questions about localisation and intensity of their pain during the last week just before going through the SF-36 questionnaire. Possibly this resulted in an increased awareness of pain. Table 1 summarises the main findings of this sample analysis.

Significant improvements of all components of HRQOL are found in the elderly. The fact that both the male and female elderly (> 65 years) show a remarkable improvement of their self-assessment of general health (GH) and that the scales of physical functioning (PF) and physical role (RP) increased

significantly supports the hypothesis that increasing life expectancy of populations is associated with an improvement of the health status of the elderly.

Regional differences between East and West Germany

As can be seen by table 2, East Germans have a more positive subjective assessment of their quality-of-life in nearly all SF-36 scales. This result is surprising considering the results of the survey relating to morbidity and health risks which clearly show that East Germans are no healthier than those from the West. Although there are no significant differences in the subjective assessment of general health (GH), clear deviations in the other scales are remarkable.

Scale distribution of the SF-36 at the population level

The SF-36 questionnaire is primarily an instrument to illustrate an HRQOL-profile on eight scales. Whenever such a profile is established in a population of patients before and after therapeutic, rehabilitating, or other intervention strategies, it is sufficient to compare the profiles to evaluate efficacy.

In the case of applying the SF-36 questionnaire at the population level, the main interest is to analyse the distribution of the scales in the population and to identify risk groups as well as influencing factors (Hemmingway et al. 1997; Radoschewski & Bellach 1999; Bellach & Radoschewski 2000).

The scales of SF-36 show so-called floor and ceiling effects. The "floor" is the worst scale value of 0 points and the best value of 100 points is the "ceiling". Looking at figure 1 it is obvious that large proportions of the study participants can be found at the ceiling level. Three scales have ceiling effects of more than 50%: (emotional role (RE) 80%, physical role (RP) 67%, and social functioning (SF) 50%). Male participants exhibit even more extreme results: Ceiling of RE 87%, of RP 75%, and of SF 60%. While the distribution of physical role (RP) and physical functioning (PF) depends on age the percentage of ceiling is not influenced by age for social functioning (SF) and emotional role (RE). Only three scales (general health (GH), vitality (VT) and mental health (MH)) have minimal floor and ceiling effects and differentiate the population across the entire scale span. However, even for these scales the distribution of their values is extremely skewed to the right (Bellach & Radoschewski 2000). This means that commonly used statistical parameters such as mean and standard deviation cannot reflect the population distribution and that the scales of SF-36 do not differentiate significantly. (This is reflected by the percentiles described in Tab. A1 and A2.)

Table 1 Mean SF-36 scores by gender, observation year, and age

	n(1998)	n(1994)	< 45 years			45 to 65 years			65 years and older		
			1994	1998	T-Test	1994	1998	T-Test	1994	1998	t-Test
PF											
male	3385	1269	95.19	94.43		85.22	84.32		68.36	74.47	**
female	3557	1580	92.47	91.81		79.70	79.34		59.20	66.29	***
RP											
male	3382	1267	92.01	91.93		81.26	81.56		70.10	71.46	
female	3520	1574	87.29	86.69		74.64	75.88		60.09	66.42	**
BP											
male	3386	1267	87.90	75.89	***	76.11	66.41	***	68.62	64.39	*
female	3563	1578	83.96	68.30	***	69.40	59.62	***	61.32	60.45	***
GH											
male	3381	1270	75.92	71.24	***	62.13	63.15		56.86	59.46	
female	3547	1583	73.11	71.53	*	60.84	62.78	*	52.50	58.10	
VT											
male	3384	1256	67.99	62.86	***	64.16	62.52		58.22	61.70	*
female	3553	1572	62.93	57.44	***	58.27	57.94		52.16	57.25	***
SF											
male	3389	1268	92.02	89.92	*	89.51	87.32	*	86.20	87.08	
female	3566	1583	87.81	85.26	*	84.53	83.81		82.39	82.46	
RE											
male	3378	1264	92.39	93.72	*	89.58	89.49		87.31	88.74	
female	3517	1576	88.78	88.55		83.61	85.58		80.41	84.24	
MH											
male	3384	1265	76.80	75.31	*	75.57	74.59		75.87	76.46	
female	3554	1575	71.77	70.22	*	69.14	69.20		67.84	69.97	*

***p < 0.001; **p < 0.01; *p < 0.1.

Abbreviations: PF = physical functioning; RP = role-physical; BP = bodily pain; GH = general health; VT = vitality; SF = social functioning; RE = role-emotional; MH = mental health.

Table 2 Mean SF-36 scores by gender, region, and age

	n	< 45 years		45 to 65 years		65 years and older		F(age) ^a	F(sex) ^a	F(region) ^a
		East	West	East	West	East	West			
PF										
male	3385	94.32	94.45	86.20	83.82	73.88	74.60	F = 493.8	F = 94.9	F = 0.3
female	3557	91.07	92.00	78.93	79.45	66.12	66.34	p < 0.0001	p < 0.0001	p < 0.6
RP										
male	3382	92.66	91.73	83.99	80.93	71.78	71.39	F = 139.3	F = 24.6	F = 8.8
female	3520	88.43	86.25	78.00	75.34	71.67	65.15	p < 0.0001	p < 0.0001	p < 0.01
BP										
male	3386	76.84	75.64	69.73	65.54	66.03	64.02	F = 78.8	F = 64.4	F = 4.6
female	3563	68.41	68.27	62.06	58.98	61.39	60.22	p < 0.0001	p < 0.0001	p < 0.1
GH										
male	3381	71.97	71.05	62.27	63.38	59.10	59.54	F = 234.6	F = 0.5	F = 0.3
female	3547	71.29	71.59	61.45	63.13	58.76	57.94	p < 0.0001	p < 0.5	p < 0.7
VT										
male	3384	63.50	62.68	63.97	62.14	61.19	61.81	F = 2.3	F = 72.3	F = 5.0
female	3553	59.32	56.97	59.59	57.51	57.14	57.28	p < 0.2	p < 0.0001	p < 0.1
SF										
male	3389	92.06	89.35	88.73	86.95	87.91	86.89	F = 12.7	F = 39.4	F = 17.7
female	3566	87.62	84.66	86.00	83.24	85.33	81.77	p < 0.0001	p < 0.0001	p < 0.0001
RE										
male	3378	96.34	93.03	91.51	88.97	92.29	87.95	F = 17.2	F = 40.5	F = 10.9
female	3517	90.33	88.10	86.85	85.25	84.23	84.24	p < 0.0001	p < 0.0001	p < 0.01
MH										
male	3384	77.30	74.79	75.52	74.35	77.62	76.21	F = 4.3	F = 130.5	F = 8.3
female	3554	71.33	69.94	70.65	68.83	70.97	69.72	p < 0.1	p < 0.0001	p < 0.01

^a ANOVA.

Abbreviations: PF = physical functioning; RP = role-physical; BP = bodily pain; GH = general health; VT = vitality; SF = social functioning; RE = role-emotional; MH = mental health.

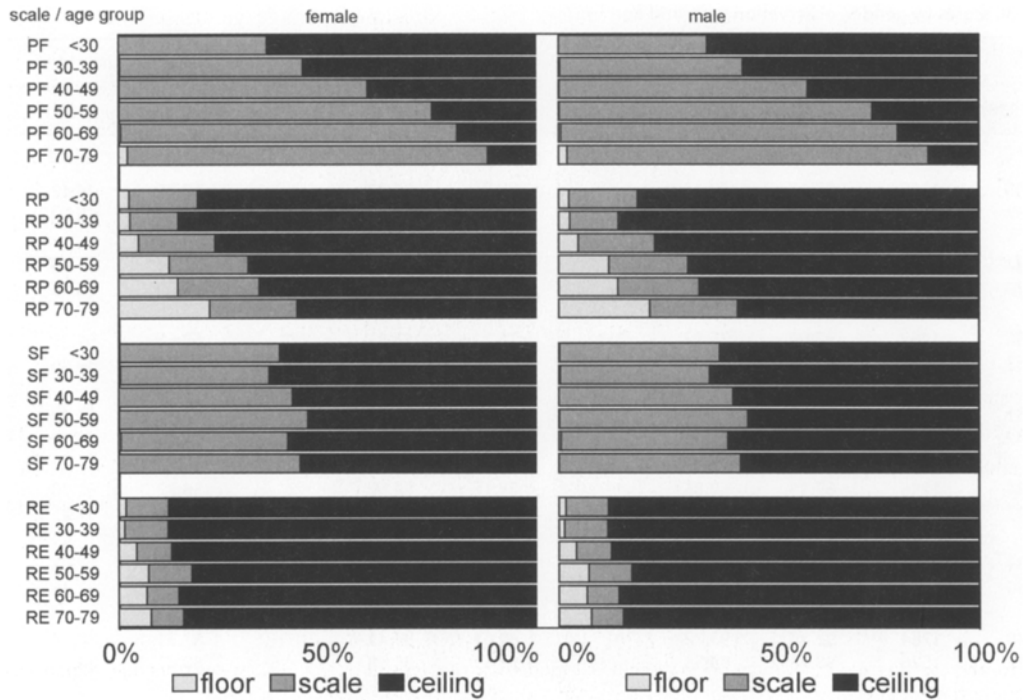


Figure 1 Floor and ceiling effects of SF-36 scales

Table 3 Estimates for the coefficients in univariate generalised linear models for the dependence of SF-36 scales from age, region, community size, and social status

	Male							
	PF	RP	BP	GH	VT	SF	RE	MH
Social class								
lower	-8.10 ^a	-8.09 ^a	-6.28 ^a	-6.70 ^a	-3.99 ^a	-3.13 ^a	-4.87 ^a	-3.23 ^a
middle	-5.65 ^a	-6.91 ^a	-6.76 ^a	-4.89 ^a	-3.14 ^a	-3.34 ^a	-3.34 ^a	-1.86 ^a
upper	0	0	0	0	0	0	0	0
Age (in years)	-0.48 ^a	-0.49 ^a	-0.34 ^a	-0.37 ^a	-0.03	-0.09 ^a	-0.15 ^a	-0.01
Region								
west	0	0	0	0	0	0	0	0
east	1.05	2.50 ^a	2.64 ^a	0.06	1.15	2.35 ^a	3.23 ^a	1.83 ^a
Community size	-0.13	0.11	-0.15	0.03	-0.24	-0.36 ^a	-0.32	-0.27
R ²	0.17	0.07	0.05	0.11	0.01	0.02	0.02	0.01
	Female							
	PF	RP	BP	GH	VT	SF	RE	MH
Social class								
lower	-7.75 ^a	-3.81 ^a	-2.25	-6.66 ^a	-4.46 ^a	-4.68 ^a	-5.28 ^a	-5.75 ^a
middle	-3.39 ^a	-2.19	-1.09	-3.04 ^a	-2.56 ^a	-2.70 ^a	-2.84 ^a	-2.63 ^a
upper	0	0	0	0	0	0	0	0
Age (in years)	-0.57 ^a	-0.48 ^a	-0.25 ^a	-0.31 ^a	0.02	-0.06 ^a	-0.12 ^a	0.00
Region								
west	0	0	0	0	0	0	0	0
east	-0.73	2.46 ^a	1.19	-0.72	1.44 ^a	2.26 ^a	1.46	1.31 ^a
Community size	-0.41 ^a	-0.68 ^a	-0.38	-0.28	-0.49 ^a	-0.68 ^a	-0.40	-0.65 ^a
R ²	0.21	0.06	0.03	0.10	0.01	0.02	0.01	0.02

^a Significant with p < 0.05.

Abbreviations: PF = physical functioning; RP = role-physical; BP = bodily pain; GH = general health; VT = vitality; SF = social functioning; RE = role-emotional; MH = mental health.

It therefore becomes even more interesting to investigate which factors influence the SF-36 scales and to find out if these scales can be used as indicators of complex health impairments. For this reason, the SF-36 scales were modelled statistically with regard to social, behavioural, and health impairment factors.

Modelling the dependence of SF-36 scales from age, gender, region, community size, social status, and number of prevalent diseases

Bivariate correlation analyses consistently showed a relationship between age, gender, region, and social status for all SF-36 scales and both gender. The multifactorial dependencies were modelled using a generalised linear model. The parameter estimates obtained by the SPSS procedure GLM are summarised in Table 3.

After adjustment for age, gender, community size, and social status the differences in East and West become even more clear: East Germans show significantly better scale values in the subjective assessment of bodily pain (BP) and vitality (VT) as well as in social functioning (SF) and emotional role (RE). East German women have significantly better scale values for bodily pain (BP) and mental health (MH). There is no scale in which East Germans score significantly lower than their West German compatriots.

The survey participants were asked about a defined number of diseases. If possible, the time period during which the disease occurred was defined as "in the last month", "in the last year" and "not in the last year". The higher the number of prevalent diseases, the lower were the means of all SF-36 scales. The worst results in all scales were observed when at least one disease had occurred during the previous four weeks (Table 4).

Table 4 Estimates for the coefficients in univariate generalised linear models for the dependence of SF-36 scales from age, region, community size, and social status, and prevalent diseases

	Male PF	RP	BP	GH	VT	SF	RE	MH
Social class								
lower	-7.41 ^a	-7.08 ^a	-4.99 ^a	-5.90 ^a	-3.39 ^a	-2.60 ^a	-4.24 ^a	-2.76 ^a
middle	-5.21 ^a	-6.28 ^a	-5.98 ^a	-4.40 ^a	-2.78 ^a	-3.01 ^a	-2.94 ^a	-1.57 ^a
upper	0	0	0	0	0	0	0	0
Age (in years)	-0.38 ^a	-0.33 ^a	-0.15 ^a	-0.26 ^a	0.06 ^a	-0.02	-0.06 ^a	0.06 ^a
Region								
west	0	0	0	0	0	0	0	0
east	0.56	1.71	1.62	-0.53	0.68	1.96 ^a	2.76 ^a	1.49 ^a
At least one disease								
last month	-7.64 ^a	-12.11 ^a	-15.78 ^a	-9.06 ^a	-7.30 ^a	-6.14 ^a	-7.39 ^a	-5.40 ^a
last year	-0.40	-2.61	-4.72 ^a	-1.69	-2.10 ^a	-1.02	-1.19	-0.84
more than one year ago	0	0	0	0	0	0	0	0
Community size	-0.17	0.27	-0.22	-0.01	-0.27	-0.39 ^a	-0.36	-0.29 ^a
R ²	0.21	0.10	0.12	0.16	0.04	0.04	0.04	0.03
	Female PF	RP	BP	GH	VT	SF	RE	MH
Social class								
lower	-7.57 ^a	-3.59 ^a	-1.97	-6.49 ^a	-4.33 ^a	-4.55 ^a	-5.10 ^a	-5.63 ^a
middle	-3.22 ^a	-1.95	-0.78	-2.86 ^a	-2.42 ^a	-2.57 ^a	-2.67 ^a	-2.51 ^a
upper	0	0	0	0	0	0	0	0
Age (in years)	-0.49 ^a	-0.36 ^a	-0.11 ^a	-0.23 ^a	0.09 ^a	0.01	-0.04	0.06 ^a
Region								
west	0	0	0	0	0	0	0	0
east	-1.07	1.92	0.54	-1.11	1.11	1.97 ^a	1.10	1.05
At least one disease								
last month	-8.11 ^a	-12.28 ^a	-15.77 ^a	-9.26 ^a	-8.02 ^a	-6.49 ^a	-8.21 ^a	-6.13 ^a
last year	-1.84	-2.93	-5.74 ^a	-2.69 ^a	-3.09 ^a	-1.10	-2.20	-1.80
more then one year ago	0	0	0	0	0	0	0	0
Community size	-0.44 ^a	-0.72 ^a	-0.44 ^a	-0.31 ^a	-0.53 ^a	-0.71 ^a	-0.43	-0.68 ^a
R ²	0.23	0.08	0.08	0.14	0.04	0.03	0.02	0.04

^a Significant with $p < 0.05$.

Abbreviations: PF = physical functioning; RP = role-physical; BP = bodily pain; GH = general health; VT = vitality; SF = social functioning; RE = role-emotional; MH = mental health.

The influence of pain on the SF-36 scales

Pain is a common disturbance of well-being and patients suffering from acute or chronic pain have a seriously degraded quality-of-life. By assessing the intensity of pain felt by those interviewed and by using the parameters of the SF-36 questionnaire it is possible to quantify the influence of pain intensity on the different components of life quality.

Taking into account the influence of age, gender, region, community size, and social status the effect of the pain intensity on SF-36 scales can again be modelled within the framework of generalised linear models (McCullagh & Nelder 1991).

The results demonstrate the overwhelming significance of pain for the well-being of the population. The pain scale is

decreasing rapidly with increasing pain intensity, but all the other scales are decreasing as well. There is a significant negative influence of pain on all SF-36 scales for men as well as for women. For women a higher impact of the intensity of pain on the scale values can be seen (Tab. 5).

Physicians' consultations in correlation to subjective health assessment

After having investigated several factors that influence the scale values of SF-36 it seems sensible to identify those factors influenced by the SF-36 scales. Initially, the dependence of the utilisation of the health system on HRQOL, as measured by SF-36 scales, was investigated.

Survey participants were asked about their last physicians' consultation. As published in Bergmann and Kamtsiuris

Table 5 Estimates for the coefficients in univariate generalised linear models for the dependence of SF-36 scales from age, region, community size, social status, and intensity of pain

	Male PF	RP	BP	GH	VT	SF	RE	MH
Social class								
lower	-7.35 ^a	-6.61 ^a	-4.39 ^a	-6.83 ^a	-3.59 ^a	-2.23 ^a	-3.88 ^a	-2.87 ^a
middle	-4.85 ^a	-5.08 ^a	-4.16 ^a	-4.48 ^a	-2.37 ^a	-2.91 ^a	-2.94 ^a	-1.46 ^a
upper	0	0	0	0	0	0	0	0
Age (in years)	-0.45 ^a	-0.42 ^a	-0.24 ^a	-0.34 ^a	-0.01	-0.07 ^a	-0.12 ^a	0.01
Region								
west	0	0	0	0	0	0	0	0
east	0.27	1.52	0.17	-0.34	0.45	1.82 ^a	3.05 ^a	1.53 ^a
Intensity of pain								
no pain	0	0	0	0	0	0	0	0
moderate	-2.59 ^a	-6.06 ^a	-18.26 ^a	-4.70 ^a	-6.13 ^a	-2.30 ^a	-1.67	-4.07 ^a
medium	-9.35 ^a	-14.16 ^a	-33.11 ^a	-8.42 ^a	-9.76 ^a	-6.57 ^a	-5.68 ^a	-5.60 ^a
severe	-18.20 ^a	-32.59 ^a	-49.76 ^a	-14.38 ^a	-14.58 ^a	-15.44 ^a	-12.66 ^a	-9.88 ^a
Community size	-0.15	0.11	-0.01	0.09	-0.25	-0.36 ^a	-0.43 ^a	-0.28 ^a
R²	0.28	0.17	0.49	0.18	0.09	0.08	0.04	0.05
	Female PF	RP	BP	GH	VT	SF	RE	MH
Social class								
lower	-5.62 ^a	-0.25	1.33	-5.15 ^a	-3.54 ^a	-3.85 ^a	-4.13 ^a	-4.81 ^a
middle	-2.35 ^a	-0.70	0.11	-2.70 ^a	-2.43 ^a	-2.58 ^a	-3.12 ^a	-2.44 ^a
upper	0	0	0	0	0	0	0	0
Age (in years)	-0.58 ^a	-0.50 ^a	0.24 ^a	-0.31 ^a	-0.01	-0.06 ^a	-0.11 ^a	0.01
Region								
west	0	0	0	0	0	0	0	0
east	-1.06	2.30	0.68	-0.73	1.30	2.39 ^a	1.36	0.86
Intensity of pain								
no pain	0	0	0	0	0	0	0	0
moderate	-3.75 ^a	-3.97 ^a	-18.52 ^a	-3.45 ^a	-3.17 ^a	-2.11 ^a	-4.23 ^a	-1.48
medium	-9.91 ^a	-13.47 ^a	-34.13 ^a	-9.64 ^a	-10.60 ^a	-7.88 ^a	-6.69 ^a	-6.27 ^a
severe	-23.69 ^a	-34.40 ^a	-52.41 ^a	-18.92 ^a	-18.38 ^a	-16.10 ^a	-15.59 ^a	-12.95 ^a
Community size	-0.20	-0.26	-0.03	-0.12	-0.41 ^a	-0.61 ^a	-0.30	-0.55 ^a
R²	0.33	0.16	0.47	0.21	0.12	0.08	0.04	0.08

^a Significant with $p < 0.05$.

Abbreviations: PF = physical functioning; RP = role-physical; BP = bodily pain; GH = general health; VT = vitality; SF = social functioning; RE = role-emotional; MH = mental health.

Table 6 SF-36 general health scale and utilisation of physicians in the last four weeks

	OR	95% CI
Female	1.629 ^c	1.473-1.802
Male	1	reference
Age (years)	1.021 ^c	1.018-1.024
Social class		
lower	1	reference
middle	1.384 ^c	1.189-1.612
upper	1.229 ^c	1.080-1.398
General health		
GH ≤ 55 ^d	2.865 ^c	2.423-3.387
GH ≤ 67 ^d	1.500 ^c	1.278-1.761
GH ≤ 82 ^d	1.201 ^a	1.028-1.404
GH > 82 ^d	1	reference
	R ² = 11.7 %	

p < 0.001^c; p < 0.005^b; p < 0.05^a.

Abbreviations: OR = odds ratio; CI = confidence interval; GH = general health.

^d Limits are the quartiles of GH.

(1999) about 90% of all Germans visit their doctor at least once a year. Half of the population had consulted a doctor during the preceding four weeks. Although a medical practitioner was consulted 11 times a year on average, half of these consultations involved only 20% of the population. The utilisation of the health care system differs by age, gender and social status. In an initial attempt to explain the contact rate of physicians using parameters of subjective health assessment, the assessment of general health (GH) was included in a logistic regression model.

The general health (GH) scale of SF-36 seems to be a good predictor for having consulted a physician during the preceding four weeks (Tab. 6). As the survey data include additional information about the specialisation of the contacted physicians and the number of consultations during the last 12 months there are more highly detailed questions to answer concerning the correlation between special SF-36 scales and the contact rates of special physicians, which will be published later.

Discussion

The description of the new normative SF-36 sample and of the distribution of the scale values leads to the conclusion that in some cases more than 50% of the population achieve the maximal values of the scale. The instrument therefore does not sufficiently differentiate between individuals. Nevertheless there are interesting group differences in the mean values of the scales: The average of all SF-36 scales increases with the social status of the individual in all age categories.

The representative sample shows a more positive subjective assessment of the quality-of-life by East Germans in nearly all scales of SF-36. A similarly astonishing result had already been observed in the national surveys 1990/92, in which East Germans evaluated their disorders much more positively. Obviously, even today citizens of East and West Germany approach the assessment of HRQOL in a different way and this requires an explanation. Possibly, the fact that the standard of medical care in the former GDR was somewhat lower than in the West enabled East German people to deal better emotionally with pain and other health problems.

Interactions exist between health, risk factors, and impairment due to pain on the one hand, and HRQOL on the other. Pain has a major negative influence on all components of quality-of-life in a dose-dependent manner.

With 41.4% of the male and 55.1% of the female study participants reporting pain of an intensity higher than three during the preceding seven days (Bellach et al. 2000) it is clear that pain is a relevant problem for public health. The quantification of the life quality reduction by SF-36 scales seems to be a very efficient method for demonstrating the importance of this health problem that needs a reaction from the health care system. (In Germany, for example, it would be desirable to intensify pain therapy to improve the HRQOL.)

Analysing the influence of morbidity and co-morbidity, a plausible correlation between the number of chronic diseases and scale averages can be observed. Independent of the severity, a higher number of lifetime diseases has a negative impact on the subjective conception of life quality.

In addition, the SF-36 questionnaire gives some explanations for the utilisation of the health care system. Because these complex relationships are potentially highly relevant for the steering concepts of health care costs further investigations are ongoing. More precise results are expected and will be published later. That SF-36 may be a useful instrument to explain utilisation of health care systems is clearly demonstrated here.

Conclusion

Using the wide variety of different questions and examinations, the informative power of the construct "quality of life" can be clearly demonstrated. Nevertheless HRQOL measurements addressing the healthy population should in the future be more sensitive and more differentiating than the commonly used instruments. More research in this area is clearly needed, although the existing instruments demonstrated their informative and therefore already useful

properties. The development of a shorter questionnaire (SF-8) applicable at the population level is underway and is presently in the pretest phase. Hopefully this instrument will be not only shorter but also more differentiating at the population level.

The concept of HRQOL will become an integral part of German health surveys.

Zusammenfassung

Der SF-36-Fragebogen in Bevölkerungsstudien: Ergebnisse aus dem Deutschen Bundesgesundheitsurvey 1998

Fragestellung: Die Beschreibung der Verteilung der Skalen des SF-36-Fragebogens in einer repräsentativen Bevölkerungserhebung.

Methoden: Beim deutschen Bundes-Gesundheitssurvey 1998 nahmen 7 124 Probanden im Alter zwischen 18 und 79 Jahren teil. Erstmals wurde der SF-36 (Short Form 36)-Fragebogen eingesetzt. Die Ergebnisse von 1998 werden mit der SF-36-Normstichprobe von 1994 verglichen.

Ergebnisse: Insbesondere für ältere Menschen (≥ 65 Jahre) sind die mittleren Werte der Lebensqualitätsskalen in den letzten vier Jahren gestiegen. Die Mittelwerte der SF-36-Skalen erhöhen sich ausserdem mit dem Sozialstatus in allen Altersgruppen. Die repräsentative Stichprobe zeigt zudem für fast alle Skalen eine bessere subjektive Einschätzung der gesundheitsbezogenen Lebensqualität bei den Ostdeutschen, obwohl sie objektiv gesehen keinen besseren Gesundheitszustand aufzuweisen haben. Die Intensität von Schmerz und die Zahl von Krankheiten im vorangegangenen Jahr verringern die Werte der Lebensqualitätsskalen. Ausserdem besteht ein Zusammenhang zwischen der Inanspruchnahme von ärztlichen Leistungen und der subjektiven Einschätzung der allgemeinen Gesundheit.

Schlussfolgerung: Durch Untersuchung sehr unterschiedlicher Fragestellungen werden die Sinnhaftigkeit und der Informationswert dieses Lebensqualitätsinstruments klar demonstriert. Dennoch müssen die Instrumente zur Messung der gesundheitsbezogenen Lebensqualität für die gesunde Bevölkerung künftig sensitiver und differenzierter werden als es der SF-36 gegenwärtig zu sein vermag.

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Résumé

Le questionnaire SF-36 dans des enquêtes de la population: de résultats de l'enquête Nationale de Santé 1998

Objectifs: Décrire la distribution des échelles du questionnaire SF-36 dans une enquête représentatif de la population allemande.

Méthodes: En Allemagne, 7 124 personnes entre 18 et 79 ans ont participé à l'enquête Nationale de Santé 1998 qui incluait pour la première fois le questionnaire SF-36 (Short Form 36). Les résultats de 1998 sont comparés à ceux du premier échantillon standardisé de 1994.

Résultats: Il est démontré que les moyennes des valeurs d'échelles de la qualité de vie ont augmenté en particulier chez les vieilles personnes pendant les quatre années précédentes. De plus les moyennes de toutes les échelles SF-36 augmentent avec le statut social des individus dans toutes les catégories d'âge. Le tirage représentatif montre en outre une estimation subjective de la qualité de vie plus positive pour les Allemands de l'Est en comparaison avec les Allemands de l'Ouest, bien qu'objectivement ils n'aient pas un état de santé supérieur. Il est démontré que l'intensité de la douleur et le nombre de maladies durant l'année précédente diminuent les valeurs des échelles de qualité de vie. De plus, l'estimation générale subjective de la santé est corrélée avec le nombre de visites chez des médecins.

Conclusions: L'instrument d'évaluation de la qualité de vie peut générer des informations utiles pour toute une série de variables. Cependant les instruments de mesure de la qualité de vie relative à la santé utilisés pour la population en bonne santé devraient à l'avenir devenir plus sensibles et plus pointus que les instruments SF-36.

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Appendix 1

Table A1 SF-36 scales in women – Germany 1998

Age (years)	n	Percentiles (P)					Mean (SD)
		P10	P25	P50	P75	P90	
Physical functioning							
18-19	124	85.0	95.0	100.0	100.0	100.0	95(9)
20-24	210	80.0	95.0	100.0	100.0	100.0	94(13)
25-29	291	80.0	90.0	100.0	100.0	100.0	93(13)
30-34	377	80.0	90.0	95.0	100.0	100.0	93(12)
35-39	392	70.0	85.0	95.0	100.0	100.0	91(14)
40-44	342	65.0	85.0	95.0	100.0	100.0	88(17)
45-49	327	65.0	80.0	90.0	100.0	100.0	86(17)
50-54	268	50.0	72.2	90.0	95.0	100.0	81(22)
55-59	400	45.0	65.0	85.0	95.0	100.0	78(23)
60-64	306	35.0	60.0	80.0	95.0	100.0	73(24)
65-69	215	25.0	60.0	80.0	90.0	100.0	73(26)
70-74	187	20.0	50.0	70.0	85.3	95.0	64(28)
75-79	133	22.9	40.0	65.0	85.0	95.0	61(26)
Role-physical							
18-19	124	75.0	100.0	100.0	100.0	100.0	95(15)
20-24	208	75.0	100.0	100.0	100.0	100.0	92(22)
25-29	290	49.3	100.0	100.0	100.0	100.0	87(29)
30-34	376	50.0	75.0	100.0	100.0	100.0	87(27)
35-39	389	25.0	75.0	100.0	100.0	100.0	85(30)
40-44	339	25.0	75.0	100.0	100.0	100.0	83(31)
45-49	319	25.0	75.0	100.0	100.0	100.0	82(31)
50-54	266	0.0	50.0	100.0	100.0	100.0	75(35)
55-59	393	0.0	50.0	100.0	100.0	100.0	73(39)
60-64	300	0.0	50.0	100.0	100.0	100.0	74(38)
65-69	215	0.0	50.0	100.0	100.0	100.0	74(38)
70-74	187	0.0	0.0	75.0	100.0	100.0	60(45)
75-79	131	0.0	25.0	75.2	100.0	100.0	65(42)
Bodily pain							
18-19	124	41.0	51.3	72.0	100.0	100.0	73(23)
20-24	210	41.0	51.0	72.0	100.0	100.0	71(24)
25-29	292	41.0	51.0	72.0	100.0	100.0	69(24)
30-34	377	41.0	51.0	72.0	84.0	100.0	69(23)
35-39	392	32.0	51.0	62.9	84.0	100.0	67(26)
40-44	343	32.0	51.0	62.0	84.0	100.0	65(25)
45-49	327	32.0	41.0	61.0	84.0	100.0	62(23)
50-54	269	22.0	41.0	61.0	84.0	100.0	60(25)
55-59	402	22.0	41.0	51.0	74.0	100.0	57(26)
60-64	306	22.0	41.0	52.0	84.0	100.0	59(27)
65-69	217	22.7	41.0	61.0	84.0	100.0	62(27)
70-74	190	22.0	41.0	61.0	84.0	100.0	59(29)
75-79	132	22.0	41.0	52.0	100.0	100.0	60(30)
General health							
18-19	125	52.0	67.0	77.0	82.0	87.0	73(14)
20-24	210	50.0	62.0	77.0	87.0	92.0	73(17)
25-29	290	52.0	67.0	77.0	82.0	92.0	73(15)
30-34	375	50.6	62.0	72.0	87.0	92.0	72(17)
35-39	391	47.0	62.0	72.0	82.0	92.0	71(17)
40-44	343	45.0	57.0	72.0	82.0	87.0	68(17)
45-49	326	40.0	52.0	67.0	77.0	89.1	65(20)
50-54	269	35.0	52.0	67.0	77.0	87.0	65(19)
55-59	396	35.0	50.0	62.0	75.0	82.0	61(19)
60-64	304	35.0	50.0	62.0	77.0	82.0	61(18)
65-69	217	35.0	45.0	57.0	72.0	87.0	59(20)
70-74	188	30.0	45.0	62.0	71.6	82.0	58(19)
75-79	132	30.0	45.0	57.8	71.5	82.0	57(20)

Table A1 (Fortsetzung)

Age (years)	n	Percentiles (P)					Mean (SD)
		P10	P25	P50	P75	P90	
Vitality							
18-19	125	35.0	50.0	59.6	65.0	76.2	57(15)
20-24	210	35.0	45.0	60.0	70.0	80.0	57(16)
25-29	291	35.0	45.0	60.0	70.0	80.0	58(18)
30-34	374	30.0	45.0	60.0	70.0	75.0	56(18)
35-39	393	30.0	45.0	60.0	70.0	80.0	58(18)
40-44	343	35.0	49.3	60.0	70.0	80.0	58(18)
45-49	325	30.0	45.0	60.0	70.0	80.0	57(20)
50-54	268	35.0	45.0	60.0	75.0	80.0	59(18)
55-59	398	30.0	45.0	60.0	70.0	80.0	56(19)
60-64	305	35.0	50.0	60.0	75.0	85.0	60(18)
65-69	216	40.0	50.0	60.0	70.0	85.0	61(16)
70-74	189	25.0	45.0	55.0	70.0	80.0	56(21)
75-79	133	30.0	40.0	50.0	65.9	85.0	54(20)
Social functioning							
18-19	125	50.0	71.2	91.5	100.0	100.0	84(20)
20-24	210	62.5	87.1	100.0	100.0	100.0	87(19)
25-29	292	62.5	75.0	100.0	100.0	100.0	86(20)
30-34	377	50.0	75.0	87.5	100.0	100.0	85(20)
35-39	393	50.0	75.0	100.0	100.0	100.0	85(21)
40-44	343	50.0	75.0	87.5	100.0	100.0	84(20)
45-49	327	50.0	75.0	87.5	100.0	100.0	84(21)
50-54	269	50.0	75.0	87.5	100.0	100.0	84(21)
55-59	402	50.0	75.0	87.5	100.0	100.0	82(23)
60-64	306	50.0	75.0	100.0	100.0	100.0	85(20)
65-69	217	50.0	75.0	100.0	100.0	100.0	86(20)
70-74	190	37.5	62.5	87.5	100.0	100.0	78(28)
75-79	133	50.0	75.0	87.0	100.0	100.0	83(21)
Role-emotional							
18-19	122	66.7	87.6	100.0	100.0	100.0	88(24)
20-24	208	66.7	100.0	100.0	100.0	100.0	92(20)
25-29	291	66.7	100.0	100.0	100.0	100.0	89(26)
30-34	376	66.7	100.0	100.0	100.0	100.0	89(26)
35-39	390	33.3	100.0	100.0	100.0	100.0	87(27)
40-44	339	33.3	100.0	100.0	100.0	100.0	87(28)
45-49	322	33.3	100.0	100.0	100.0	100.0	86(28)
50-54	265	33.3	100.0	100.0	100.0	100.0	88(28)
55-59	394	0.0	100.0	100.0	100.0	100.0	82(34)
60-64	304	33.3	100.0	100.0	100.0	100.0	86(30)
65-69	215	66.7	100.0	100.0	100.0	100.0	91(26)
70-74	186	0.0	66.7	100.0	100.0	100.0	76(40)
75-79	129	0.0	100.0	100.0	100.0	100.0	85(32)
Mental health							
18-19	125	44.0	57.3	69.7	80.0	88.0	68(16)
20-24	210	45.4	60.0	72.0	80.0	88.0	70(16)
25-29	292	48.0	60.0	76.0	84.0	88.0	71(16)
30-34	374	44.0	56.0	72.0	84.0	88.0	69(17)
35-39	393	48.0	60.0	75.0	84.0	88.0	71(16)
40-44	343	48.0	60.0	72.0	84.0	88.0	70(17)
45-49	326	43.3	56.0	72.0	84.0	88.0	69(19)
50-54	268	44.0	60.0	72.0	84.0	92.0	71(18)
55-59	397	40.0	56.0	68.0	80.0	88.0	67(19)
60-64	305	45.1	60.0	72.0	84.0	92.0	70(17)
65-69	216	44.0	60.0	72.0	84.0	92.0	71(17)
70-74	189	38.4	52.0	76.0	88.0	92.0	69(21)
75-79	133	40.0	56.0	76.0	84.0	92.0	70(19)

Appendix 2

Table A2 SF-36 scales in men – Germany 1998

Age (years)	n	Percentiles (P)					Mean (SD)
		P10	P25	P50	P75	P90	
Physical functioning							
18-19	140	90.0	95.0	100.0	100.0	100.0	96(9)
20-24	234	85.0	95.0	100.0	100.0	100.0	95(10)
25-29	256	90.0	95.0	100.0	100.0	100.0	96(9)
30-34	363	87.1	95.0	100.0	100.0	100.0	95(9)
35-39	389	85.0	95.0	100.0	100.0	100.0	93(13)
40-44	316	80.0	90.0	95.0	100.0	100.0	93(12)
45-49	304	75.0	90.0	95.0	100.0	100.0	90(15)
50-54	283	60.0	80.0	95.0	95.0	100.0	85(19)
55-59	382	45.0	75.0	90.0	100.0	100.0	82(22)
60-64	281	40.0	70.0	85.0	95.0	100.0	79(22)
65-69	199	40.0	72.7	85.0	95.0	100.0	78(23)
70-74	158	30.0	60.0	85.0	95.0	100.0	74(27)
75-79	71	30.0	53.4	70.0	90.0	95.0	66(26)
Role-physical							
18-19	140	75.0	100.0	100.0	100.0	100.0	92(20)
20-24	234	75.0	100.0	100.0	100.0	100.0	91(21)
25-29	255	75.0	100.0	100.0	100.0	100.0	92(20)
30-34	365	75.0	100.0	100.0	100.0	100.0	94(19)
35-39	388	75.0	100.0	100.0	100.0	100.0	92(21)
40-44	316	50.0	100.0	100.0	100.0	100.0	89(24)
45-49	303	50.0	100.0	100.0	100.0	100.0	88(27)
50-54	284	10.2	75.0	100.0	100.0	100.0	82(33)
55-59	382	0.0	75.0	100.0	100.0	100.0	79(36)
60-64	280	0.0	75.0	100.0	100.0	100.0	78(37)
65-69	198	0.0	50.0	100.0	100.0	100.0	75(38)
70-74	158	0.0	50.0	100.0	100.0	100.0	73(39)
75-79	69	0.0	0.0	100.0	100.0	100.0	61(45)
Bodily pain							
18-19	141	41.0	62.0	84.0	100.0	100.0	79(24)
20-24	234	41.3	61.0	84.0	100.0	100.0	77(23)
25-29	256	41.0	62.0	84.0	100.0	100.0	77(23)
30-34	365	42.0	61.0	80.0	100.0	100.0	76(22)
35-39	389	41.0	61.0	74.0	100.0	100.0	76(23)
40-44	316	41.0	51.0	72.0	100.0	100.0	73(24)
45-49	303	32.0	51.0	72.0	100.0	100.0	70(26)
50-54	284	22.0	41.0	62.0	100.0	100.0	66(27)
55-59	383	22.0	41.0	62.0	84.0	100.0	64(27)
60-64	280	32.0	41.0	62.0	100.0	100.0	66(26)
65-69	199	31.0	41.0	62.0	84.0	100.0	64(25)
70-74	158	32.0	41.0	72.0	100.0	100.0	69(28)
75-79	70	31.0	41.0	61.0	80.0	100.0	59(26)
General health							
18-19	141	57.0	67.0	77.0	90.7	97.0	77(16)
20-24	234	52.0	62.0	77.0	87.0	95.0	75(17)
25-29	255	52.0	62.0	72.0	82.0	92.0	72(15)
30-34	364	52.0	62.0	72.0	82.0	87.0	72(16)
35-39	389	47.0	62.0	72.0	82.0	90.0	70(17)
40-44	313	47.0	57.0	67.0	79.5	87.0	67(16)
45-49	302	47.0	57.4	72.0	82.0	87.0	69(16)
50-54	282	36.2	50.0	67.0	77.0	84.4	63(18)
55-59	383	35.0	47.0	62.0	72.0	82.0	61(18)
60-64	279	35.0	50.0	62.0	72.0	77.0	60(16)
65-69	199	40.0	45.0	62.0	72.0	82.0	60(18)
70-74	157	35.0	48.4	60.0	72.0	82.0	58(18)
75-79	71	40.0	50.0	62.0	72.0	85.0	61(17)

Table A2 (Fortsetzung)

Age (years)	n	Percentiles (P)					Mean (SD)
		P10	P25	P50	P75	P90	
Vitality							
18-19	141	35.0	50.0	65.0	71.9	79.1	60(17)
20-24	234	45.0	55.0	65.0	75.0	80.0	64(14)
25-29	256	40.0	50.0	65.0	75.0	80.0	63(16)
30-34	365	45.0	55.0	65.0	75.0	80.0	63(15)
35-39	389	40.0	50.0	65.0	75.0	80.0	62(17)
40-44	315	40.0	55.0	65.0	75.0	85.0	64(16)
45-49	303	40.0	55.0	65.0	75.0	80.0	65(16)
50-54	283	35.0	50.0	65.0	75.0	85.0	61(18)
55-59	383	36.2	50.0	65.0	75.0	85.0	62(18)
60-64	277	35.0	50.0	65.0	75.0	85.0	62(18)
65-69	200	40.0	50.0	65.0	75.0	85.0	63(19)
70-74	157	35.0	45.0	65.0	80.0	85.0	62(20)
75-79	71	31.6	45.0	60.0	70.0	80.0	58(19)
Social functioning							
18-19	141	50.0	87.5	100.0	100.0	100.0	87(21)
20-24	234	68.4	87.5	100.0	100.0	100.0	91(15)
25-29	256	62.5	87.5	100.0	100.0	100.0	90(15)
30-34	365	75.0	87.5	100.0	100.0	100.0	91(17)
35-39	389	62.5	87.5	100.0	100.0	100.0	89(18)
40-44	316	62.5	87.5	100.0	100.0	100.0	89(18)
45-49	303	62.5	87.5	100.0	100.0	100.0	89(17)
50-54	284	50.0	75.0	100.0	100.0	100.0	85(21)
55-59	383	50.0	75.0	100.0	100.0	100.0	87(19)
60-64	280	62.5	75.0	100.0	100.0	100.0	88(19)
65-69	200	62.5	87.5	100.0	100.0	100.0	88(20)
70-74	158	62.5	87.5	100.0	100.0	100.0	87(20)
75-79	71	50.0	75.0	100.0	100.0	100.0	84(23)
Role-emotional							
18-19	141	66.7	100.0	100.0	100.0	100.0	91(23)
20-24	234	66.7	100.0	100.0	100.0	100.0	93(21)
25-29	256	66.7	100.0	100.0	100.0	100.0	95(16)
30-34	364	66.7	100.0	100.0	100.0	100.0	94(19)
35-39	386	66.7	100.0	100.0	100.0	100.0	95(16)
40-44	315	66.7	100.0	100.0	100.0	100.0	92(23)
45-49	303	66.7	100.0	100.0	100.0	100.0	91(25)
50-54	284	33.3	100.0	100.0	100.0	100.0	88(29)
55-59	381	33.3	100.0	100.0	100.0	100.0	88(28)
60-64	279	66.7	100.0	100.0	100.0	100.0	90(27)
65-69	199	33.3	100.0	100.0	100.0	100.0	88(29)
70-74	158	53.3	100.0	100.0	100.0	100.0	89(30)
75-79	69	33.3	100.0	100.0	100.0	100.0	90(27)
Mental health							
18-19	141	50.4	64.0	76.0	84.0	88.0	73(15)
20-24	234	56.0	68.0	76.0	88.0	92.0	76(14)
25-29	256	56.0	68.0	80.0	84.0	92.0	76(14)
30-34	365	56.0	68.0	79.3	84.0	92.0	76(15)
35-39	389	52.0	68.0	76.0	85.0	92.0	75(14)
40-44	315	52.0	68.0	80.0	84.0	92.0	75(15)
45-49	303	52.0	68.0	80.0	88.0	92.0	76(15)
50-54	283	48.0	64.0	76.0	88.0	92.0	73(17)
55-59	383	52.0	64.0	76.0	88.0	92.0	74(17)
60-64	277	52.0	64.0	76.0	88.0	92.0	75(16)
65-69	200	56.0	68.0	80.0	88.0	96.0	77(17)
70-74	157	52.0	68.0	80.0	88.0	93.0	76(16)
75-79	71	56.0	68.0	76.0	88.0	93.5	76(14)