

## EXTENDED REPORT

Health related quality of life in multiple musculoskeletal diseases: SF-36 and EQ-5D in the DMC<sub>3</sub> study

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*Ann Rheum Dis* 2004;**63**:723–729. doi: 10.1136/ard.2003.010769

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Accepted 26 July 2003

**Objective:** To examine the health related quality of life of persons with one or more self reported musculoskeletal diseases, as measured by the short form 36 item health status survey (SF-36) and the Euroqol questionnaire (EQ-5D).

**Methods:** A sample of Dutch inhabitants aged 25 years or more (n = 3664) participated in a questionnaire survey. Twelve lay descriptions of common musculoskeletal diseases were presented and the subjects were asked whether they had ever been told by a physician that they had any of these. Their responses were used to assess the prevalence of these conditions. Commonly used scores of SF-36 and descriptive scores from EQ-5D are presented, along with standardised differences between disease groups and the general population.

**Results:** Subjects with musculoskeletal diseases had significantly lower scores on all SF-36 dimensions than those without musculoskeletal disease, especially for physical functioning (SF-36 score (SE), 75.2 (0.5) v 87.8 (0.5)); role limitations caused by physical problems (67.1 (0.9) v 85.8 (0.8)); and bodily pain (68.5 (0.5) v 84.1 (0.5)). The worst health related quality of life patterns were found for osteoarthritis of the hip, osteoporosis, rheumatoid arthritis, and fibromyalgia. Those with multiple musculoskeletal diseases had the poorest health related quality of life. Similar results were found for EQ-5D.

**Conclusions:** All musculoskeletal diseases involve pain and reduced physical function. The coexistence of musculoskeletal diseases should be taken into account in research and clinical practice because of its high prevalence and its substantial impact on health related quality of life.

The goal of the Bone and Joint Decade 2000–2010 is to improve the health related quality of life for people with musculoskeletal disorders throughout the world.<sup>1</sup> The Decade is a multidisciplinary global campaign to implement and promote initiatives in all parts of the world and is endorsed by many international organisations (for example the World Health Organisation and the United Nations) and national governments (see also [www.boneandjointdecade.org](http://www.boneandjointdecade.org)).

Many instruments are available for measuring health related quality of life. The medical outcomes study short form 36 item health status survey questionnaire (SF-36) and the Euroqol five item questionnaire for measuring health related quality of life (EQ-5D) are two of the most commonly used generic (that is, not disease specific) measures<sup>2</sup> used to quantify the health related quality of life in people with musculoskeletal disorders.<sup>3–24</sup> Studies employing the SF-36 have been undertaken in patients with chronic back disorders,<sup>3–6</sup> arthritis,<sup>7</sup> osteoarthritis,<sup>8</sup> rheumatoid arthritis,<sup>9–14</sup> spinal problems,<sup>15</sup> musculoskeletal diseases in general,<sup>5 16</sup> and several specific musculoskeletal disorders.<sup>16 17</sup> The EQ-5D has been used for back disorders,<sup>18</sup> osteoarthritis of the knee,<sup>19</sup> rheumatoid arthritis,<sup>20</sup> and several musculoskeletal diseases.<sup>21</sup> Some studies have analysed both SF-36 and EQ-5D in patients with back disorders,<sup>22</sup> arthritis,<sup>23</sup> and rheumatoid arthritis.<sup>24</sup>

Most of these studies focused on only one musculoskeletal disease, but comorbidity of musculoskeletal disorders is common.<sup>25</sup> In addition, comparison between studies is often limited owing to differences in study design, case definition and selection, age group, presentation of the data, and probably also language and culture. Data on health related quality of life in patients with different musculoskeletal diseases should preferably be based on a single large dataset and should take into account the coexistence of musculoskeletal

diseases. In this paper we present data on health related quality of data (using both SF-36 and EQ-5D) for 12 different self reported musculoskeletal diseases as assessed in a population based survey in the Netherlands. We pay special attention to the effect of multiple musculoskeletal diseases on health related quality of life.

## METHODS

The data were from the Dutch, population based, musculoskeletal complaints and consequences cohort study (DMC<sub>3</sub>).

## Study population

The Dutch population of 1998 consisted of over 15 million inhabitants, of whom over 10 million were aged 25 years or more. A random sample of 8000 persons aged 25 years or more, stratified by 10 year age bands and sex (numbers of equal size per age–sex band), was taken from the population register of 1998, identical to general surveys of Statistics Netherlands.<sup>26</sup> In September to December of 1998 all questionnaires were sent with a hand signed introduction letter indicating the importance of participation. The net response of the DMC<sub>3</sub> study after two reminders (after three and six weeks) was 46.9% (n = 3664). This was calculated by dividing the number of respondents by the number of those actually approached, excluding those who were known to be deceased or whose addresses were unknown. Further information on non-response is given elsewhere.<sup>26</sup>

**Abbreviations:** DMC<sub>3</sub>, Dutch population based musculoskeletal complaints and consequences cohort study; EQ-5D, Euroqol five item questionnaire for measuring health related quality of life; SF-36, Medical Outcomes Study short form 36 item health status survey

## Questionnaire

We used a 28 page full colour questionnaire consisting of general questions and health questions. On the basis of a list of 12 descriptions of common diagnoses of musculoskeletal diseases, subjects were asked to indicate whether or not a physician ever told them they had any of the diseases. The list was preceded by an introductory text as follows: "There are many diseases of the musculoskeletal system. Some are common, some are rare. Please indicate whether a physician or medical specialist ever told you that you have one or more of the following the diseases." The descriptions used are given in tables 2 and 3. The description in the questionnaire sometimes differed—thus RSI (repetitive strain injury) also included "for example, a computer arm"; the term osteoarthritis was also accompanied by "wear and tear"; osteoporosis was accompanied by the non-medical term "decalcification of the bones"; and for tendinitis or capsulitis we used "inflammation or condition of tendon or joint capsule." For this survey we have analysed the test-retest reliability of the self reported diseases and these were acceptable.<sup>25</sup> The survey did not include a validity measure such as a comparison with a diagnosis based on physical examination.

Dutch versions of the SF-36<sup>27, 28</sup> and the EQ-5D<sup>29</sup> were used. The SF-36 consists of 36 items that are employed to calculate scores on eight dimensions: physical functioning, role limitation due to physical health problems, bodily pain, general health, vitality, social functioning, role limitation due to emotional health problems, and mental health. Scores had a range of between 0 and 100, with a higher score indicating a better health related quality of life.

The EQ-5D consists of five questions with three response categories. The questions involve the following dimensions: mobility, self care, usual activities, pain, and anxiety/depression. The results of the EQ-5D are expressed as the percentage of subjects with moderate or major problems (any problem).<sup>30</sup>

## Statistical analysis

To present estimations for the Dutch population, weighting factors were used to make the distribution by age, sex, region, and marital status the same as that in the Netherlands in 1998. We present the health related quality of life scores for 12 different disease groups, eight SF36 dimensions, and five

EQ-5D dimensions. These data are also corrected for differences by age. It is not feasible to present statistical tests for every disease by disease comparison. We therefore present the standard errors so that readers can judge for themselves whether a difference is large or not. The difference between two groups reaches statistical significance (at the 5% level) if it is larger than 1.96 times the square root of the sum of the squared standard errors of both groups.

The methods of presenting the results of SF-36 (a score between 0 and 100) and EQ-5D (the proportion with problems) are not directly comparable. To compare the results of these two health related quality of life measures, we also calculated a standardised difference score—that is, the difference between the subject's score and the weighted score of the general population, divided by the standard deviation of the unweighted score of the general population. This standardised score (the *z* value or normal score) is a rescaled score with a population average of 0 and a standard deviation of 1. These standardised difference scores are comparable between dimensions and between SF-36 and EQ-5D.

All analyses of data were done using SAS version 6.12.

## RESULTS

Table 1 gives the scores of the SF-36 and EQ-5D dimensions in the DMC<sub>3</sub> population. The numbers of subjects missing were slightly greater for the SF-36 than for the EQ-5D—the percentages varying from 1.6% (usual activities, EQ-5D) to 8.6% (role limitations from emotional health problems, SF-36). The internal consistency for the different SF-36 subscales was acceptable to good, varying from 0.64 (social functioning) to 0.92 (physical functioning).

The scores from the health related quality of life measures for the different musculoskeletal diseases are presented in table 2 (SF-36) and table 3 (EQ-5D). For all musculoskeletal diseases and all quality of life dimensions it was found that having the disease was associated with a worse health related quality of life. Subjects with any of the 12 musculoskeletal diseases had significantly lower scores on all SF-36 dimensions than those without musculoskeletal disease, especially for physical functioning (SF-36 score (SE), 75.2 (0.5) *v* 87.8 (0.5)), role limitations from physical problems (67.1 (0.9) *v* 85.8 (0.8)), and bodily pain (68.5 (0.6) *v* 84.1 (0.5)). Those reporting a musculoskeletal disease also reported more health

**Table 1** Scores on SF-36 and EQ-5D in total population aged 25 years or more (n = 3664), weighted for the Dutch age-sex population of 1998, and the standard deviations of the unweighted scores

	Score	SD	Per cent missing*	Internal consistency†
<i>SF-36 (mean scores)</i>				
Physical functioning	82.5	24.8	5.4	0.92
Role-physical	77.7	37.8	7.1	0.90
Bodily pain	80.2	23.6	2.4	0.86
General health	69.4	19.6	6.9	0.81
Vitality	65.9	20.0	4.7	0.77
Social functioning	84.2	23.1	2.6	0.64
Role-emotional	87.2	30.6	8.6	0.87
Mental health	77.3	17.1	5.3	0.80
<i>EQ-5D (% with any problem)</i>				
Mobility	19.0	43.0	1.7	NA
Self care	4.2	22.7	2.6	NA
Usual activities	22.2	43.1	1.6	NA
Pain/discomfort	45.2	50.0	2.3	NA
Anxiety/depression	18.6	39.3	2.1	NA

\*SF-36 scales become missing when at least half of the composing items is missing.

†Cronbach's  $\alpha$ .

EQ-5D, Euroqol five item questionnaire for measuring health related quality of life; NA, not applicable; SF-36, Medical Outcomes Study short form 36 item health status survey.

**Table 2** SF-36 scores among persons with musculoskeletal diseases (DMC<sub>3</sub> study)

	N	Physical functioning	Role-physical	Bodily pain	General health	Vitality	Social functioning	Role-emotional	Mental health
Herniated disc (spine)	368	73.2 (1.1)	65.8 (2.0)	67.3 (1.3)	62.9 (1.1)	61.4 (1.1)	77.7 (1.2)	82.6 (1.7)	73.2 (0.9)
Gout	138	75.6 (2.0)	68.1 (3.6)	70.2 (2.2)	64.7 (1.9)	60.8 (1.9)	79.1 (2.2)	78.7 (3.0)	73.2 (1.7)
RSI	63	73.5 (2.5)	65.1 (4.4)	64.5 (2.7)	64.9 (2.3)	60.2 (2.4)	79.2 (2.7)	82.7 (3.7)	72.8 (2.0)
Epicondylitis	418	80.5 (1.1)	68.1 (1.9)	71.0 (1.2)	67.8 (1.0)	63.1 (1.0)	82.4 (1.1)	82.8 (1.6)	75.1 (0.9)
Osteoarthritis of knee	547	67.6 (1.0)	61.0 (1.9)	62.7 (1.1)	60.1 (1.0)	58.8 (1.0)	75.7 (1.1)	80.4 (1.6)	72.0 (0.9)
Osteoarthritis of hip	354	62.4 (1.4)	52.8 (2.5)	59.1 (1.5)	60.0 (1.3)	56.8 (1.3)	73.2 (1.5)	80.5 (2.1)	73.5 (1.2)
Osteoporosis	280	64.3 (1.4)	55.9 (2.6)	60.9 (1.6)	58.6 (1.3)	56.7 (1.4)	69.8 (1.6)	77.2 (2.2)	68.9 (1.2)
Whiplash	79	72.3 (2.3)	57.6 (4.2)	62.7 (2.6)	63.0 (2.2)	58.3 (2.3)	77.3 (2.5)	78.0 (3.5)	72.3 (1.9)
Rheumatoid arthritis	156	62.3 (2.0)	49.0 (3.5)	58.0 (2.2)	52.1 (1.8)	52.2 (1.9)	70.3 (2.1)	72.3 (3.0)	69.2 (1.6)
Other chronic arthritis	155	65.0 (1.9)	54.7 (3.4)	57.3 (2.1)	53.3 (1.8)	54.5 (1.8)	69.9 (2.0)	74.1 (2.8)	70.7 (1.6)
Fibromyalgia	43	55.0 (3.2)	41.4 (5.8)	48.2 (3.6)	50.1 (3.0)	39.9 (3.1)	60.3 (3.4)	81.5 (4.8)	64.1 (2.6)
Tendinitis and capsulitis	587	75.3 (0.8)	62.9 (1.5)	66.2 (0.9)	63.1 (0.8)	60.5 (0.8)	79.4 (0.9)	83.4 (1.3)	73.8 (0.7)
One MSD	957	80.0 (0.6)	74.3 (1.2)	73.8 (0.7)	67.7 (0.6)	64.6 (0.6)	83.2 (0.7)	86.7 (1.0)	76.0 (0.6)
Two MSD	478	72.7 (1.0)	63.0 (1.8)	65.5 (1.0)	64.0 (0.9)	60.2 (1.0)	79.6 (1.1)	84.0 (1.5)	73.8 (0.8)
Three MSD	193	63.4 (1.6)	53.2 (3.0)	57.0 (1.8)	55.8 (1.6)	56.0 (1.6)	69.1 (1.8)	76.0 (2.6)	69.9 (1.4)
Four or more MSD	148	56.2 (1.8)	34.9 (3.3)	47.1 (2.0)	50.2 (1.8)	47.8 (1.8)	63.9 (2.1)	66.0 (2.9)	65.8 (1.6)
Any MSD	1776	75.2 (0.5)	67.1 (0.9)	68.5 (0.6)	64.6 (0.5)	61.6 (0.5)	79.8 (0.6)	83.7 (0.8)	74.3 (0.4)
No MSD	1888	87.8 (0.5)	85.8 (0.8)	84.1 (0.5)	72.8 (0.4)	69.3 (0.5)	87.6 (0.5)	89.8 (0.8)	79.7 (0.4)

Values are mean (SE).

DMC<sub>3</sub>, Dutch population based musculoskeletal complaints and consequences cohort study; MSD, musculoskeletal disease; RSI, repetitive strain injury; SF-36, Medical Outcomes Study short form 36 item health status survey.

problems on the EQ-5D dimensions than those without a musculoskeletal disease—for example, for mobility (29.9% *v* 10.5%), pain/discomfort (62.5% *v* 31.2%), and usual activities (34.5% *v* 12.4%).

With an increasing number of musculoskeletal conditions the health related quality of life deteriorated (fig 1). In fig 1 both the ordinary scores and the standardised scores of SF36 and EQ-5D are given. The standardised scores show that the differences in health related quality of life between subjects with more than one musculoskeletal disease and those without musculoskeletal diseases were similar for SF36 and EQ-5D. The quality of life patterns for five different musculoskeletal diseases expressed as standardised scores (the difference in the number of standard deviations from the population mean) are shown in fig 2. For these diseases the total pattern is shown and also the patterns for subjects

with only the particular disease and those with at least one other musculoskeletal disease. Some of these patterns were now based on a very small number of cases, especially, rheumatoid arthritis only (n = 23), and fibromyalgia only (n = 9), so the results give only an indication of the patterns.

In general, the health related quality of life scores for subjects with coexistent musculoskeletal disorders were worse than those with only one specific disease. The patterns were, however, similar.

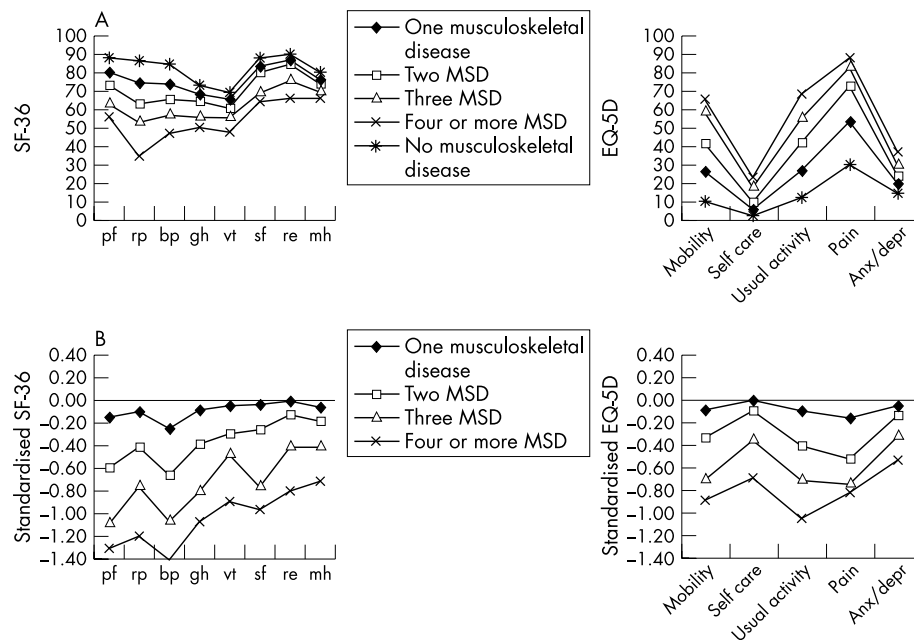
The dimensions typically affected by musculoskeletal diseases were physical functioning and pain on the SF36, and the dimensions “mobility” and “pain” on the EQ-5D. The diseases with the worst health related quality of life for those dimensions were: osteoarthritis of the knee or hip, rheumatoid arthritis, other types of chronic arthritis, osteoporosis, and fibromyalgia. The diseases with the least severe

**Table 3** EQ-5D scores for persons with musculoskeletal diseases (DMC<sub>3</sub> study)

	n	Any problem (moderate and severe) on EQ-5D dimension				
		Mobility	Self care	Usual activities	Pain/discomfort	Anxiety/depression
Herniated disc (spine)	368	29.9 (1.9)	8.1 (1.1)	36.6 (2.2)	65.3 (2.7)	27.7 (2.1)
Gout	138	31.9 (3.5)	3.6 (1.9)	32.8 (4.0)	59.2 (4.7)	22.8 (3.8)
RSI	63	27.7 (4.3)	7.4 (2.3)	44.4 (4.9)	78.7 (5.8)	23.3 (4.7)
Epicondylitis	418	21.5 (1.8)	3.7 (1.0)	32.0 (2.1)	54.0 (2.5)	21.3 (2.0)
Osteoarthritis of knee	547	44.1 (1.7)	10.0 (1.0)	40.9 (2.0)	71.1 (2.4)	28.3 (1.9)
Osteoarthritis of hip	354	56.3 (2.3)	14.8 (1.3)	51.9 (2.7)	76.6 (3.2)	26.8 (2.6)
Osteoporosis	280	41.3 (2.5)	16.1 (1.4)	49.3 (2.9)	72.3 (3.4)	30.3 (2.7)
Whiplash	79	20.1 (4.1)	6.1 (2.2)	41.0 (4.6)	71.3 (5.5)	24.2 (4.4)
Rheumatoid arthritis	156	52.1 (3.3)	15.6 (1.9)	54.3 (3.8)	80.6 (4.6)	28.5 (3.7)
Other chronic arthritis	155	42.5 (3.3)	16.3 (1.8)	49.8 (3.8)	78.1 (4.4)	33.1 (3.6)
Fibromyalgia	43	66.7 (5.5)	12.3 (3.0)	73.8 (6.3)	93.1 (7.6)	4.17 (6.1)
Tendinitis or capsulitis	587	29.5 (1.5)	6.6 (0.8)	37.7 (1.7)	65.1 (2.0)	22.7 (1.6)
One MSD	957	22.7 (1.1)	4.5 (0.6)	26.3 (1.3)	53.3 (1.5)	20.4 (1.3)
Two MSD	478	33.1 (1.7)	6.5 (1.0)	39.8 (1.9)	71.1 (2.3)	23.6 (1.9)
Three MSD	193	49.0 (2.8)	12.3 (1.6)	52.2 (3.2)	82.2 (3.8)	30.3 (3.2)
Four or more MSD	148	57.2 (3.2)	19.7 (1.9)	66.7 (3.7)	85.8 (4.4)	39.1 (3.7)
Any MSD	1776	29.9 (0.9)	6.6 (0.5)	34.5 (1.0)	62.5 (1.2)	23.3 (1.0)
No MSD	1888	10.5 (0.8)	2.3 (0.4)	12.4 (0.9)	31.2 (1.1)	14.8 (0.9)

Values are per cent with problems (SE).

DMC<sub>3</sub>, Dutch population based musculoskeletal complaints and consequences cohort study; EQ-5D, Euroqol five item questionnaire for measuring health related quality of life; MSD, musculoskeletal disease.



**Figure 1** Health related quality of life by comorbidity of musculoskeletal diseases (MSD). (A) Absolute scores of SF36 (left) and EQ-5D (right). (B) Standardised scores of SF-36 and EQ-5D. bp, bodily pain; gh, general health; mh, mental health; pf, physical functioning; re, role-emotional; rp, role-physical; sf, social functioning; vt, vitality.

scores on these dimensions were epicondylitis, whiplash injury, repetitive strain injury, and tendinitis and capsulitis.

For the health related quality of life dimensions involving mental health problems, most musculoskeletal diseases did not score lower than the general population. These dimensions included vitality, role limitation due to emotional problems, and mental health on the SF36, and the dimension anxiety/depression on the EQ-5D. Two exceptions were fibromyalgia (for all these dimensions) and rheumatoid arthritis (only a low score on vitality).

## DISCUSSION

The results of this study show a worse health related quality of life in people with musculoskeletal diseases than in the general population, typically in the areas of pain, physical functioning or mobility, role limitation due to physical health problems, and usual activities. The worst quality of life patterns were found for osteoarthritis of the hip or knee, osteoporosis, rheumatoid arthritis, and fibromyalgia. Health related quality of life scores were lowest among those with multiple musculoskeletal diseases. The results were similar for both SF-36 and EQ-5D.

The specific and substantial impact of musculoskeletal diseases on health related quality of life has already been shown for several disorders. Compared with other chronic diseases, patients with musculoskeletal disorders usually report the lowest health related quality of life.<sup>3 5 12 16 23</sup> Comparison of scores between studies is difficult owing to differences in case definition and selection, comorbidity, age, presentation of the data, and probably also language and culture. We will present some comparisons with other studies, taking a few of these methodological differences into account and focusing on SF-36 data for osteoarthritis of the knee and rheumatoid arthritis (table 4).

Our SF-36 scores are more favourable than data from clinical samples.<sup>8 24</sup> This is not unexpected because selection of patients in the general population will result in a less severe patient population than selection in hospitals or outpatient clinics. Our SF-36 scores were slightly lower than in self reported disease groups from a general Australian

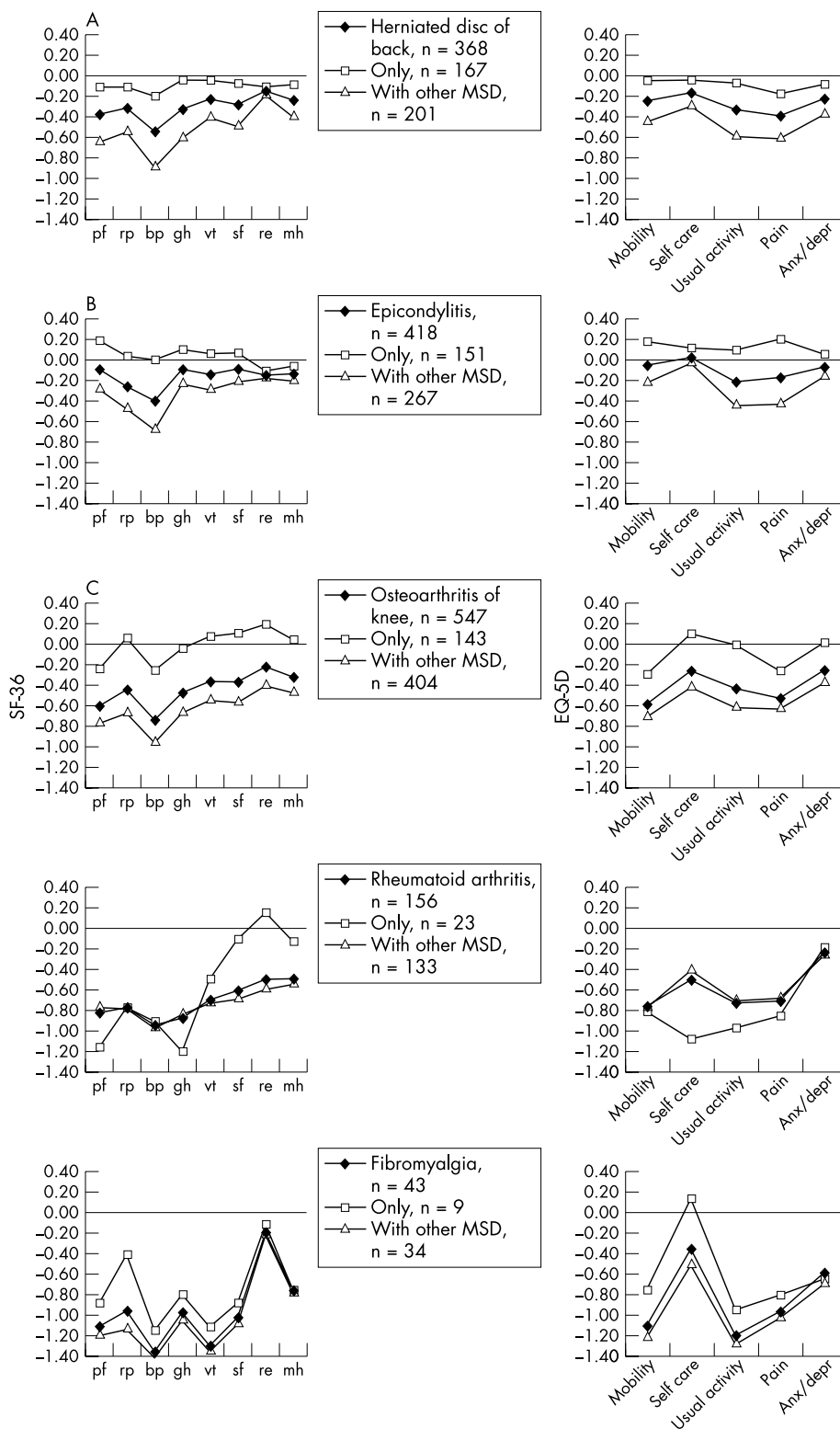
population sample.<sup>7</sup> This may reflect a difference in the perception of the disease category between Australian and Dutch subjects.

The strength of our study is the assessment of multiple musculoskeletal diseases. This reveals the important influence of comorbidity on the health related quality of life. We have found no other examples of studies that took the coexistence of several musculoskeletal diseases into account. In the future this factor should be considered during the design of studies and in descriptions of health related quality of life. Other chronic diseases apart from musculoskeletal disease—for example, cardiovascular diseases, cancer, chronic obstructive pulmonary disease, or diabetes—will probably also have a substantial impact on health related quality of life among individuals with musculoskeletal disorders.<sup>31</sup> Future studies should pay attention to this type of comorbidity as well.

In presenting health related quality of life data we employed both the commonly used scores for quality of life measures and the standardised difference from the population means. Standardised SF-36 scores have been used by others as well,<sup>2 7 11</sup> but their use is not yet common. Some studies have shown deviation from the population norms without dividing by the standard deviation.<sup>15 17</sup> We found no example of the use of standardised scores for the EQ-5D. The advantage of the use of standardised scores is that it gives a direct picture of reductions in health related quality of life among disease groups. The choice of population means can, however, be a problem. Some studies have used previously published data on the SF-36,<sup>11 15 17</sup> but population norms may depend on the method of data collection (by interview or by questionnaire).<sup>32</sup> In addition, population means will differ by country, culture, or language, which reduces the validity of international comparisons even further. However, considering the health related quality of life of chronic diseases in its cultural environment can be viewed as an advantage.

Although the standard SF-36 subscale scores are usually presented as means with standard deviations or standard errors, that procedure is not entirely correct because the





**Figure 2** Patterns of health related quality of life for musculoskeletal diseases compared with the general population. SF-36 scores and EQ-5D scores expressed as number of standard deviations from the population mean. bp, bodily pain; gh, general health; mh, mental health; pf, physical functioning; re, role-emotional; rp, role-physical; sf, social functioning; vt, vitality.

scores are categorical—for example, the role-physical score has only the following possible standardised scores: 0, 25, 50, 75, and 100. Alternative measures include the median to describe a group average or to present the percentage scoring below a certain cut off point.<sup>33</sup> As far as we are aware, there is no clinically significant cut off point for the SF-36, so for the

purposes of this paper we employed the commonly used SF scoring method.

Limitations of our data should be taken into account in their interpretation.

First, self reporting of data has obvious limitations, especially for musculoskeletal diseases. We attempted to

**Table 4** SF-36 scores for patient groups from various different studies

	n	PF	RP	BP	GH	VT	SF	RE	MH
<i>Osteoarthritis of knee</i>									
DMC <sub>3</sub> study, self reported	547	67.6	61.0	62.7	60.1	58.8	75.7	80.4	72.0
Australian, self reported <sup>7</sup>	258	74.4	63.3	61.2	55.2	56.5	82.0	88.2	79.0
Knee replacement patients <sup>24</sup>	109	21.0	11.8	35.2	56.4	40.9	51.2	42.0	67.6
Rheuma clinic patients <sup>24</sup>	112	27.9	12.4	32.7	45.4	37.7	53.1	41.0	63.2
Rehabilitation sample <sup>8</sup>	232	38.4	22.4	28.2	55.2	43.1	66.8	53.5	64.7
<i>Rheumatoid arthritis</i>									
DMC <sub>3</sub> study, self reported	156	62.3	49.0	58.0	52.1	52.2	70.3	72.3	69.2
Australian, self reported <sup>7</sup>	120	72.7	65.4	58.6	58.6	52.7	78.5	83.4	76.3
Clinical sample <sup>14</sup>	233	31	25	37	44	39	54	59	69
Clinical sample <sup>13</sup>	43	45.3	33.7	57.1	54.2	42.7	75.6	52.8	72.3
Clinical sample <sup>11*</sup>	84	24	18	27	43	32	52	35	58
Registered population <sup>12</sup>	1030	52	31	44	44	42	67	56	70
Registered population <sup>10</sup>	1030	47.3	27.0	41.0	42.0	39.4	63.7	52.0	68.1

\*Estimated from figure in original paper.

BP, bodily pain; GH, general health; MH, mental health; PF, physical functioning; RE, role limitation because of emotional health; RP, role limitation because of physical health; SF, social functioning; SF-36, Medical Outcomes Study short form 36 item health status survey; VT, vitality.

exclude self diagnosed or imagined diseases by asking respondents to indicate whether or not a physician had ever told them that they had the disease. It is still possible, however, that diseases are reported that were not diagnosed by a physician. In addition there are also bound to be some undiagnosed diseases. There are sparse data on the reliability and validity of self reports of musculoskeletal disease. Their validity is difficult to assess and the existing data suggest that it is poor.<sup>34, 35</sup> The strong association between self reported musculoskeletal diseases and a reduced health related quality of life can, however, be interpreted as a indication of validity.

Another limitation of our study is the relatively high rate of non-response. However, on the basis of the general characteristics of the population register, there were no important differences between responders and non-responders, nor did responders in the DMC<sub>3</sub> study—a postal survey—differ from responder in an interview survey.<sup>26</sup>

We employed two commonly used generic health related quality of life measures. Arguments for choosing between SF-36 (eight dimensions) and EQ-5D (five dimensions) include measurement characteristics, the coverage of a broad field of health related quality of life dimensions, quality issues, international acceptance and use of a measure, and the purpose of a specific research project. Advantages of the EQ-5D (five dimensions) include its brevity and simplicity, while the advantages of the SF-36 include its broader coverage, but this is only an advantage if all these dimensions are relevant for a particular research question. The internal consistency of the SF-36 dimensions were acceptable and similar to other data.<sup>3, 36</sup> The only exception is the dimension "social functioning," which had a low internal consistency in our study (0.64) compared with others (for example, 0.83<sup>36</sup> and 0.80<sup>3</sup>).

If a reduction in questionnaire length is an issue in a musculoskeletal disease study, then the EQ-5D is a reasonable option for a generic health measure, because it covers the most important health related quality of life dimensions for musculoskeletal diseases.

## Conclusions

All musculoskeletal diseases involve pain and reduced physical functioning. The coexistence of more than one musculoskeletal disease is important to recognise because it is relatively common and has a substantial impact on health related quality of life.

## ACKNOWLEDGEMENTS

The Dutch population based musculoskeletal complaints and consequences cohort (DMC<sub>3</sub> study) was supported by the Ministry of Health, Welfare and Sport of the Netherlands and the National Institute of Public Health and the Environment and was carried out in collaboration with Statistics Netherlands.

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## REFERENCES

- 1 Woolf AD. The bone and joint decade 2000–2010. *Ann Rheum Dis* 2000;**59**:81–2.
- 2 Garratt A, Schmidt L, Mackintosh A, Fitzpatrick R. Quality of life measurement: bibliographic study of patient assessed health outcome measures. *BMJ* 2002;**324**:1417–21.
- 3 Garratt AM, Ruta DA, Abdella MI, Buckingham JK, Russell IT. The SF-36 health survey questionnaire: an outcome measure suitable for routine use within the NHS? *BMJ* 1993;**306**:1440–4.
- 4 Garratt AM, Ruta DA, Abdella MI, Russell IT. SF-36 health survey questionnaire: II. Responsiveness to changes in health status in four common clinical conditions. *Qual Health Care* 1994;**3**:186–92.
- 5 Kempen GJMM, Ormel J, Brilman EI, Relyveld J. Adaptive responses among Dutch elderly: the impact of eight chronic medical conditions on health-related quality of life. *Am J Public Health* 1997;**87**:38–44.
- 6 Gatchel RJ, Polatin PB, Mayer TG, Robinson R, Dersh J. Use of the SF-36 health status survey with a chronically disabled back pain population: strengths and limitations. *J Occup Rehabil* 1998;**8**:237–46.
- 7 Hill CL, Parsons J, Taylor A, Leach G. Health related quality of life in a population sample with arthritis. *J Rheumatol* 1999;**26**:2029–35.
- 8 Angst F, Aeschlimann A, Steiner W, Stucki G. Responsiveness of the WOMAC osteoarthritis index as compared with the SF-36 in patients with osteoarthritis of the legs undergoing a comprehensive rehabilitation intervention. *Ann Rheum Dis* 2001;**60**:834–40.
- 9 Talamo J, Frater A, Gallivan S, Young A. Use of the short form 36 (SF-36) for health status measurement in rheumatoid arthritis. *Br J Rheumatol* 1997;**36**:463–9.
- 10 Kvien TK, Kaasa S, Smedstad LM. Performance of the Norwegian SF-36 Health Survey in patients with rheumatoid arthritis II. A comparison of the SF-36 with disease-specific measures. *J Clin Epidemiol* 1998;**51**:1077–86.
- 11 Birrell FN, Hassell AB, Jones PW, Daves PT. How does the short form 36 health questionnaire (SF-36) in rheumatoid arthritis (RA) relate to RA outcome measures and SF-36 population values? A cross-sectional study. *Clin Rheumatol* 2000;**19**:195–9.
- 12 Stavem K, Lossius MI, Kvien TK, Guldvog B. The health-related quality of life of patients with epilepsy compared with angina pectoris, rheumatoid arthritis, asthma and chronic obstructive pulmonary disease. *Qual Life Res* 2000;**9**:865–71.
- 13 Husted JA, Gladman DD, Farewell VT, Cook RJ. Health-related quality of life of patients with psoriatic arthritis: a comparison with patients with rheumatoid arthritis. *Arthritis Rheum* 2001;**45**:151–8.
- 14 Ruta DA, Hurst NP, Kind P, Hunter M, Stubbings A. Measuring health status in British patients with rheumatoid arthritis: reliability, validity and responsiveness of the short form 36-item health survey (SF-36). *Br J Rheumatol* 1998;**37**:425–36.

- 15 **Fanuele JC**, Birkmeyer NJ, Abdu WA, Tosteson TD, Weinstein JN. The impact of spinal problems on the health status of patients: have we underestimated the effect? *Spine* 2000;**25**:1509-14.
- 16 **Sprangers MAG**, de Regt EB, Andries F, *et al*. Which chronic conditions are associated with better or poorer quality of life? *J Clin Epidemiol* 2000;**53**:895-907.
- 17 **Strombeck B**, Ekdahl C, Manthorpe R, Wikstrom I, Jacobsson L. Health-related quality of life in primary Sjogren's syndrome, rheumatoid arthritis and fibromyalgia compared to normal population data using SF-36. *Scand J Rheumatol* 2000;**29**:20-8.
- 18 **Garratt AM**, Klaber Moffett J, Farrin AJ. Responsiveness of generic and specific measures of health outcome in low back pain. *Spine* 2001;**26**:71-7.
- 19 **Fransen M**, Edmonds J. Reliability and validity of the EuroQol in patients with osteoarthritis of the knee. *Rheumatology (Oxford)* 1999;**38**:807-13.
- 20 **Hurst NP**, Kind P, Ruta D, Hunter M, Stubbings A. Measuring health-related quality of life in rheumatoid arthritis: validity, responsiveness and reliability of EuroQol (EQ-5D). *Br J Rheumatol* 1997;**36**:551-9.
- 21 **Wolfe F**, Hawley DJ. Measurement of the quality of life in rheumatic disorders using the EuroQol. *Br J Rheumatol* 1997;**36**:786-93.
- 22 **Suarez-Almazor ME**, Kendall C, Johnson JA, Skeith K, Vincent D. Use of health status measures in patients with low back pain in clinical settings. Comparison of specific, generic and preference-based instruments. *Rheumatology (Oxford)* 2000;**39**:783-90.
- 23 **Johnson JA**, Coons SJ. Comparison of the EQ-5D and SF-12 in an adult US sample. *Qual Life Res* 1998;**7**:155-66.
- 24 **Brazier JE**, Harper R, Munro J, Walters SJ, Snaith ML. Generic and condition-specific outcome measures for people with osteoarthritis of the knee. *Rheumatology (Oxford)* 1999;**38**:870-7.
- 25 **Picavet HSJ**, Hazes JMW. The prevalence of self-reported musculoskeletal diseases is high. *Ann Rheum Dis* 2003;**62**:644-50.
- 26 **Picavet HSJ**. National health interview surveys by mail or home interview: effects on response. *J Epidemiol Community Health* 2001;**55**:408-13.
- 27 **Ware JE**, Sherbourne CD. The MOS 36-item short-form health status survey (SF-36). 1. Conceptual framework and item selection. *Med Care* 1992;**30**:473-83.
- 28 **Van der Zee KI**, Sanderman R. *Het meten van de algemene gezondheidstoestand met de RAND-36: een handleiding*. Groningen: Noordelijk Centrum voor Gezondheidsvraagstukken, Rijksuniversiteit Groningen, 1993.
- 29 **Euroqol Group**. Euroqol—a new facility for the measurement of health-related quality of life. *Health Policy* 1990;**16**:199-208.
- 30 **Kind P**, Dolan P, Gudex C, Williams A. Variations in population health status: results from a United Kingdom national questionnaire survey. *BMJ* 1998;**316**:736-41.
- 31 **Gijsen R**, Hoeymans N, Schellevis FG, Ruwaard D, Satariano WA, Bos GAM van den. Causes and consequences of comorbidity: a review. *J Clin Epidemiol* 2000;**54**:661-74.
- 32 **McHorney CA**, Kosinski M, Ware JE. Comparisons of the costs and quality of norms for the SF-36 health survey collected by mail versus telephone interview: results from a national survey. *Med Care* 1994;**32**:551-67.
- 33 **Rose SM**, Koshman ML, Spreng S, Sheldon R. Statistical issues encountered in the comparison of health-related quality of life in diseased patients to published general population norms: problems and solutions. *J Clin Epidemiol* 1999;**52**:405-12.
- 34 **Kvien TK**, Glennas A, Knudsrød OG, Smedstad LM. The validity of self-reported diagnosis of rheumatoid arthritis: results from a population survey followed by clinical examinations. *J Rheumatol* 1996;**23**:1866-71.
- 35 **Star VL**, Scott JC, Sherwin R, Lane N, Nevitt MC, Hochberg MC. Validity of self-reported rheumatoid arthritis in elderly women. *J Rheumatol* 1996;**23**:1862-5.
- 36 **Aaronson Muller M**, Cohen PDA, *et al*. Translation, validation and norming of the Dutch language version of the SF-36 Health Survey in community and chronic disease populations. *J Clin Epidemiol* 1998;**51**:1055-68.