

**Additional file 4** Health-Related Quality of Life in Relation to Symptomatic and Radiographic Definitions of Knee Osteoarthritis: Data from Osteoarthritis Initiative (OAI) 4-Year Follow-Up Study

These tables report estimated marginal means of SF-6D-disutility scores, the parameter estimates, and 95% confidence intervals (CI) from GEE-analyses.

**Table S5** Estimated marginal means of SF-6D-disutility scores and 95% confidence intervals (CI) from GEE-analyses

	Mean (95% CI)	p
<b>Symptomatic OA status † (2-scale)</b>		
No	-0.220 (-0.226;-0.215)	
Yes, uni- or bilateral	-0.246 (-0.252;-0.239)	<0.001*
<b>Symptomatic OA status † (3-scale)</b>		
No	-0.220 (-0.226;-0.214)	
Yes, unilateral	-0.244 (-0.250;-0.237)	<0.001*
Yes, bilateral	-0.250 (-0.258;-0.242)	<0.001*
<b>K-L grade ≥2 (2-scale)</b>		
No	-0.225 (-0.232;-0.218)	
Yes, uni- or bilateral	-0.231 (-0.237;-0.225)	0.040*
<b>K-L grade ≥2 (3-scale)</b>		
No	-0.224 (-0.231;-0.216)	
Yes, unilateral	-0.225 (-0.231;-0.218)	0.774
Yes, bilateral	-0.237 (-0.243;-0.230)	<0.001*
<b>The highest K-L grade</b>		
0	-0.223 (-0.231;-0.215)	
1	-0.225 (-0.233;-0.216)	0.706
2	-0.226 (-0.233;-0.220)	0.349
3	-0.231 (-0.238;-0.224)	0.055
4	-0.249 (-0.259;-0.240)	<0.001*
<b>Mean of K-L grades</b>		
0.0	-0.222 (-0.230;-0.213)	
0.5	-0.224 (-0.234;-0.214)	0.651
1.0	-0.218 (-0.226;-0.209)	0.375
1.5	-0.224 (-0.232;-0.216)	0.554
2.0	-0.234 (-0.242;-0.227)	0.004*
2.5	-0.230 (-0.239;-0.221)	0.118
3.0	-0.241 (-0.250;-0.231)	0.001*
3.5	-0.258 (-0.270;-0.246)	<0.001*
4.0	-0.262 (-0.284;-0.240)	0.001*
<b>Combination of K-L grades</b>		
(0;0)	-0.222 (-0.230;-0.213)	
(1;0)	-0.224 (-0.234;-0.214)	0.674
(1;1)	-0.221 (-0.234;-0.209)	0.969
(2;0)	-0.215 (-0.225;-0.206)	0.217
(2;1)	-0.225 (-0.234;-0.216)	0.476
(2;2)	-0.233 (-0.241;-0.225)	0.015*
(3;0)	-0.224 (-0.237;-0.211)	0.741
(3;1)	-0.231 (-0.244;-0.218)	0.196
(3;2)	-0.229 (-0.239;-0.220)	0.152
(3;3)	-0.240 (-0.250;-0.229)	0.003*
(4;0)	-0.250 (-0.271;-0.229)	0.010*

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(4;1)	-0.232 (-0.256;-0.209)	0.375
(4;2)	-0.242 (-0.257;-0.227)	0.012*
(4;3)	-0.258 (-0.270;-0.246)	<0.001*
(4;4)	-0.262 (-0.284;-0.240)	0.001*

\* The mean difference is significant at the  $p < 0.05$  level, p-values are presented in comparison to reference groups (“No OA” or “K-L grade 0”)

† K-L-grade  $\geq 2$  and knee pain on more than half the days during past month in the same knee

**Table S6** Parameter estimates from GEE-analyses, symptomatic OA status (2-scale)

Parameter	Category	B	95% CI	p
<b>Symptomatic OA status † (2-scale)</b>	Yes, uni- or bilateral	-0.025	-0.029;-0.021	<0.001*
	No	1.0		
<b>Age, years</b>	>65	0.018	0.012;0.025	<0.001*
	55-64	0.007	0.001;0.013	0.022*
	45-54	1.0		
<b>Gender</b>	Female	-0.013	-0.019;-0.006	<0.001*
	Male	1.0		
<b>Race</b>	Other	-0.012	-0.021;-0.004	0.005*
	White or Caucasian	1.0		
<b>Education ‡</b>	None / Primary	-0.034	-0.041;-0.027	<0.001*
	Secondary	-0.011	-0.018;-0.004	0.002*
	Tertiary	1.0		
<b>Living status (number of persons)</b>	Living with someone else	0.015	0.009;0.022	<0.001*
	Live alone	1.0		
<b>BMI, kg/m2</b>	≥35	-0.031	-0.040;-0.022	<0.001*
	30 to <35	-0.015	-0.022;-0.008	<0.001*
	25 to <30	-0.003	-0.009;0.003	0.365
	<25	1.0		
<b>Comorbidities</b>	score >0	-0.023	-0.028;-0.018	<0.001*
	score 0	1.0		
<b>Physical activity, PASE §</b>	0-90	-0.026	-0.032;-0.020	<0.001*
	91-134	-0.013	-0.019;-0.008	<0.001*
	135-175	-0.004	-0.009;0.002	0.210
	176-237	-0.003	-0.008;0.002	0.292
	238-580	1.0		
<b>Smoking status</b>	Current	-0.030	-0.041;-0.020	<0.001*
	Former	-0.005	-0.011;0.001	0.074
	Never	1.0		
<b>Knee injuries</b>	Yes	-0.020	-0.026;-0.014	<0.001*
	No	1.0		
<b>Knee surgical history</b>	Yes	0.005	-0.002;0.012	0.169
	No	1.0		

\*The difference is significant at the p<0.05 level

† K-L grade ≥2 and knee pain on more than half the days during past month in the same knee

‡ The highest grade of school completed: tertiary (graduate degree), secondary (college graduate or some graduate school), and primary/none level (less than college)

§ Physical activity PASE score quintiles (higher scores indicate greater physical activity)

**Table S7** Parameter estimates from GEE-analyses, symptomatic OA status (3-scale)

<b>Parameter</b>		<b>B</b>	<b>95% CI</b>	<b>p</b>
<b>Symptomatic OA status † (3-scale)</b>	Yes, unilateral	-0.030	-0.036;-0.023	<0.001*
	Yes, bilateral	-0.024	-0.028;-0.019	<0.001*
	No	1.0		
<b>Age, years</b>	>65	0.018	0.012;0.025	<0.001*
	55-64	0.007	0.001;0.013	0.022*
	45-54	1.0		
<b>Gender</b>	Female	-0.012	-0.019;-0.006	<0.001*
	Male	1.0		
<b>Race</b>	Other	-0.012	-0.021;-0.004	0.006*
	White or Caucasian	1.0		
<b>Education ‡</b>	None / Primary	-0.034	-0.041;-0.027	<0.001*
	Secondary	-0.011	-0.018;-0.004	0.002*
	Tertiary	1.0		
<b>Living status (number of persons) ‡</b>	Living with someone else	0.015	0.009;0.022	<0.001*
	Live alone	1.0		
<b>BMI, kg/m2</b>	≥35	-0.030	-0.040;-0.021	<0.001*
	30 to <35	-0.015	-0.022;-0.008	<0.001*
	25 to <30	-0.003	-0.009;0.003	0.367
	<25	1.0		
<b>Comorbidities §</b>	score >0	-0.023	-0.028;-0.018	<0.001*
	score 0	1.0		
<b>Physical activity, PASE</b>	0-90	-0.026	-0.032;-0.020	<0.001*
	91-134	-0.013	-0.019;-0.008	<0.001*
	135-175	-0.004	-0.009;0.002	0.211
	176-237	-0.003	-0.008;0.002	0.297
	238-580	1.0		
<b>Smoking status</b>	Current	-0.030	-0.041;-0.020	<0.001*
	Former	-0.005	-0.011;0.000	0.073
	Never	1.0		
<b>Knee injuries</b>	Yes	-0.020	-0.026;-0.014	<0.001*
	No	1.0		
<b>Knee surgical history</b>	Yes	0.005	-0.002;0.012	0.164
	No	1.0		

\*The difference is significant at the  $p < 0.05$  level

† K-L grade  $\geq 2$  and knee pain on more than half the days during past month in the same knee

‡ The highest grade of school completed: tertiary (graduate degree), secondary (college graduate or some graduate school), and primary/none level (less than college)

§ Physical activity PASE score quintiles (higher scores indicate greater physical activity)

**Table S8** Parameter estimates from GEE-analyses, K-L grade  $\geq 2$  (2-scale)

Parameter	Category	B	95% CI	p
<b>K-L grade <math>\geq 2</math> (2-scale)</b>	Yes, uni- or bilateral	-0.006	-0.012;0.000	0.040*
	No	1.0		
<b>Age, years</b>	>65	0.017	0.011;0.024	<0.001*
	55-64	0.007	0.001;0.012	0.027*
	45-54	1.0		
<b>Gender</b>	Female	-0.013	-0.020;-0.007	<0.001*
	Male	1.0		
<b>Race</b>	Other	-0.015	-0.024;-0.006	0.001*
	White or Caucasian	1.0		
<b>Education ‡</b>	None / Primary	-0.035	-0.043;-0.028	<0.001*
	Secondary	-0.010	-0.018;-0.003	0.004*
	Tertiary	1.0		
<b>Living status (number of persons)</b>	Living with someone else	0.015	0.008;0.021	<0.001*
	Live alone	1.0		
<b>BMI, kg/m<sup>2</sup></b>	$\geq 35$	-0.034	-0.044;-0.025	<0.001*
	30 to <35	-0.018	-0.025;-0.010	<0.001*
	25 to <30	-0.004	-0.010;0.002	0.215
	<25	1.0		
<b>Comorbidities</b>	score >0	-0.023	-0.028;-0.017	<0.001*
	score 0	1.0		
<b>Physical activity, PASE §</b>	0-90	-0.026	-0.032;-0.020	<0.001*
	91-134	-0.013	-0.019;-0.007	<0.001*
	135-175	-0.004	-0.009;0.002	0.206
	176-237	-0.003	-0.008;0.002	0.221
	238-580	1.0		
<b>Smoking status</b>	Current	-0.030	-0.041;-0.020	<0.001*
	Former	-0.005	-0.011;0.000	0.074
	Never	1.0		
<b>Knee injuries</b>	Yes	-0.020	-0.026;-0.014	<0.001*
	No	1.0		
<b>Knee surgical history</b>	Yes	0.002	-0.006;0.009	0.651
	No	1.0		

\*The difference is significant at the  $p < 0.05$  level

† K-L grade  $\geq 2$  and knee pain on more than half the days during past month in the same knee

‡ The highest grade of school completed: tertiary (graduate degree), secondary (college graduate or some graduate school), and primary/none level (less than college)

§ Physical activity PASE score quintiles (higher scores indicate greater physical activity)

**Table S9** Parameter estimates from GEE-analyses, K–L grade  $\geq 2$  (3-scale)

Parameter	Category	B	95% CI	p
<b>K-L grade <math>\geq 2</math> (3-scale)</b>	Yes, bilateral	-0.013	-0.020;-0.006	<0.001*
	Yes, unilateral	-0.001	-0.007;0.005	0.774
	No	1.0		
<b>Age, years</b>	>65	0.018	0.012;0.025	<0.001*
	55–64	0.007	0.001;0.013	0.019*
	45–54	1.0		
<b>Gender</b>	Female	-0.013	-0.019;-0.006	<0.001*
	Male	1.0		
<b>Race</b>	Other	-0.014	-0.023;-0.005	0.002*
	White or Caucasian	1.0		
<b>Education ‡</b>	None / Primary	-0.035	-0.042;-0.027	<0.001*
	Secondary	-0.010	-0.018;-0.003	0.004*
	Tertiary	1.0		
<b>Living status (number of persons)</b>	Living with someone else	0.015	0.008;0.021	<0.001*
	Live alone	1.0		
<b>BMI, kg/m<sup>2</sup></b>	$\geq 35$	-0.033	-0.042;-0.023	<0.001*
	30 to <35	-0.017	-0.024;-0.010	<0.001*
	25 to <30	-0.004	-0.010;0.003	0.253
	<25	1.0		
<b>Comorbidities</b>	score >0	-0.023	-0.028;-0.017	<0.001*
	score 0	1.0		
<b>Physical activity, PASE §</b>	0–90	-0.026	-0.032;-0.020	<0.001*
	91–134	-0.013	-0.019;-0.007	<0.001*
	135–175	-0.004	-0.009;0.002	0.208
	176–237	-0.003	-0.008;0.002	0.212
	238–580	1.0		
<b>Smoking status</b>	Current	-0.030	-0.041;-0.020	<0.001*
	Former	-0.005	-0.011;0.000	0.067
	Never	1.0		
<b>Knee injuries</b>	Yes	-0.020	-0.026;-0.014	<0.001*
	No	1.0		
<b>Knee surgical history</b>	Yes	0.002	-0.005;0.009	0.600
	No	1.0		

\*The difference is significant at the  $p < 0.05$  level

† K-L grade  $\geq 2$  and knee pain on more than half the days during past month in the same knee

‡ The highest grade of school completed: tertiary (graduate degree), secondary (college graduate or some graduate school), and primary/none level (less than college)

§ Physical activity PASE score quintiles (higher scores indicate greater physical activity)

**Table S10** Parameter estimates from GEE-analyses, the highest K-L grade

Parameter	Category	B	95% CI	p
<b>The highest K-L grade</b>	4	-0.027	-0.037;-0.016	<0.001*
	3	-0.008	-0.017;0.000	0.055
	2	-0.004	-0.011;0.004	0.349
	1	-0.002	-0.011;0.007	0.706
	0	1.0		
<b>Age, years</b>	>65	0.019	0.012;0.026	<0.001*
	55-64	0.007	0.001;0.013	0.016*
	45-54	1.0		
<b>Gender</b>	Female	-0.014	-0.021;-0.007	<0.001*
	Male	1.0		
<b>Race</b>	Other	-0.015	-0.024;-0.007	0.001*
	White or Caucasian	1.0		
<b>Education ‡</b>	None / Primary	-0.035	-0.042;-0.028	<0.001*
	Secondary	-0.011	-0.018;-0.003	0.004*
	Tertiary	1.0		
<b>Living status (number of persons)</b>	Living with someone else	0.015	0.008;0.021	<0.001*
	Live alone	1.0		
<b>BMI, kg/m2</b>	≥35	-0.033	-0.043;-0.024	<0.001*
	30 to <35	-0.017	-0.024;-0.010	<0.001*
	25 to <30	-0.004	-0.010;0.003	0.248
	<25	1.0		
<b>Comorbidities</b>	score >0	-0.023	-0.028;-0.017	<0.001*
	score 0	1.0		
<b>Physical activity, PASE §</b>	0-90	-0.026	-0.032;-0.020	<0.001*
	91-134	-0.013	-0.018;-0.007	<0.001*
	135-175	-0.003	-0.009;0.002	0.232
	176-237	-0.003	-0.008;0.002	0.266
	238-580	1.0		
<b>Smoking status</b>	Current	-0.031	-0.042;-0.020	<0.001*
	Former	-0.005	-0.011;0.000	0.070
	Never	1.0		
<b>Knee injuries</b>	Yes	-0.019	-0.025;-0.013	<0.001*
	No	1.0		
<b>Knee surgical history</b>	Yes	0.004	-0.003;0.012	0.253
	No	1.0		

\*The difference is significant at the  $p < 0.05$  level

† K-L grade  $\geq 2$  and knee pain on more than half the days during past month in the same knee

‡ The highest grade of school completed: tertiary (graduate degree), secondary (college graduate or some graduate school), and primary/none level (less than college)

§ Physical activity PASE score quintiles (higher scores indicate greater physical activity)

**Table S11** Parameter estimates from GEE-analyses, mean of K-L grades

Parameter	Category	B	95% CI	p
<b>Mean of K-L grades</b>	4.0	-0.040	-0.063;-0.018	0.001*
	3.5	-0.036	-0.049;-0.023	<0.001*
	3.0	-0.019	-0.030;-0.008	0.001*
	2.5	-0.008	-0.018;0.002	0.118
	2.0	-0.012	-0.021;-0.004	0.004*
	1.5	-0.003	-0.011;0.006	0.554
	1.0	0.004	-0.005;0.013	0.375
	0.5	-0.002	-0.013;0.008	0.651
	0.0	1.0		
<b>Age, years</b>	>65	0.020	0.013;0.027	<0.001*
	55-64	0.008	0.002;0.014	0.011*
	45-54	1.0		
<b>Gender</b>	Female	-0.013	-0.020;-0.007	<0.001*
	Male	1.0		
<b>Race</b>	Other	-0.014	-0.022;-0.005	0.002*
	White or Caucasian	1.0		
<b>Education ‡</b>	None / Primary	-0.035	-0.042;-0.027	<0.001*
	Secondary	-0.010	-0.018;-0.003	0.005*
	Tertiary	1.0		
<b>Living status (number of persons)</b>	Living with someone else	0.015	0.008;0.021	<0.001*
	Live alone	1.0		
<b>BMI, kg/m<sup>2</sup></b>	≥35	-0.032	-0.041;-0.022	<0.001*
	30 to <35	-0.016	-0.023;-0.009	<0.001*
	25 to <30	-0.003	-0.009;0.003	0.296
	<25	1.0		
<b>Comorbidities</b>	score >0	-0.023	-0.028;-0.017	<0.001*
	score 0	1.0		
<b>Physical activity, PASE §</b>	0-90	-0.026	-0.032;-0.020	<0.001*
	91-134	-0.013	-0.018;-0.007	<0.001*
	135-175	-0.004	-0.009;0.002	0.206
	176-237	-0.003	-0.008;0.002	0.250
	238-580	1.0		
<b>Smoking status</b>	Current	-0.031	-0.041;-0.020	<0.001*
	Former	-0.005	-0.011;0.000	0.058
	Never	1.0		
<b>Knee injuries</b>	Yes	-0.019	-0.025;-0.013	<0.001*
	No	1.0		
<b>Knee surgical history</b>	Yes	0.004	-0.004;0.012	0.295
	No	1.0		

\*The difference is significant at the p<0.05 level

† K-L grade ≥2 and knee pain on more than half the days during past month in the same knee

‡ The highest grade of school completed: tertiary (graduate degree), secondary (college graduate or some graduate school), and primary/none level (less than college)

§ Physical activity PASE score quintiles (higher scores indicate greater physical activity)



**Table S12** Parameter estimates from GEE-analyses, combination of K-L grades

<b>Parameter</b>	<b>Category</b>	<b>B</b>	<b>95% CI</b>	<b>p</b>
<b>Combination of K-L grades</b>	(4;4)	-0.040	-0.063;-0.017	0.001*
	(4;3)	-0.036	-0.049;-0.023	<0.001*
	(4;2)	-0.021	-0.036;-0.005	0.012*
	(4;1)	-0.011	-0.035;0.013	0.375
	(4;0)	-0.028	-0.050;-0.007	0.010*
	(3;3)	-0.018	-0.030;-0.006	0.003*
	(3;2)	-0.008	-0.018;0.003	0.152
	(3;1)	-0.009	-0.023;0.005	0.196
	(3;0)	-0.002	-0.016;0.011	0.741
	(2;2)	-0.011	-0.021;-0.002	0.015*
	(2;1)	-0.003	-0.013;0.006	0.476
	(2;0)	0.006	-0.004;0.016	0.217
	(1;1)	0.000	-0.012;0.013	0.969
	(1;0)	-0.002	-0.012;0.008	0.674
(0;0)	1.0			
<b>Age, years</b>	>65	0.020	0.013;0.027	<0.001*
	55-64	0.008	0.002;0.014	0.011*
	45-54	1.0		
<b>Gender</b>	Female	-0.013	-0.020;-0.007	<0.001*
	Male	1.0		
<b>Race</b>	Other	-0.014	-0.023;-0.005	0.002*
	White or Caucasian	1.0		
<b>Education ‡</b>	None / Primary	-0.035	-0.042;-0.027	<0.001*
	Secondary	-0.010	-0.018;-0.003	0.004*
	Tertiary	1.0		
<b>Living status (number of persons)</b>	Living with someone else	0.015	0.008;0.021	<0.001*
	Live alone	1.0		
<b>BMI, kg/m2</b>	≥35	-0.032	-0.041;-0.023	<0.001*
	30 to <35	-0.016	-0.024;-0.009	<0.001*
	25 to <30	-0.003	-0.010;0.003	0.286
	<25	1.0		
<b>Comorbidities</b>	score >0	-0.023	-0.028;-0.017	<0.001*
	score 0	1.0		
<b>Physical activity, PASE §</b>	0-90	-0.026	-0.032;-0.019	<0.001*
	91-134	-0.013	-0.018;-0.007	<0.001*
	135-175	-0.003	-0.009;0.002	0.220
	176-237	-0.003	-0.008;0.002	0.264
	238-580	1.0		
<b>Smoking status</b>	Current	-0.031	-0.041;-0.020	<0.001*
	Former	-0.005	-0.011;0.000	0.063
	Never	1.0		
<b>Knee injuries</b>	Yes	-0.019	-0.025;-0.013	<0.001*
	No	1.0		
<b>Knee surgical history</b>	Yes	0.004	-0.003;0.012	0.272

**Additional file 4** Health-Related Quality of Life in Relation to Symptomatic and Radiographic Definitions of Knee Osteoarthritis: Data from Osteoarthritis Initiative (OAI) 4-Year Follow-Up Study

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No	1.0
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\*The difference is significant at the  $p < 0.05$  level

† K-L grade  $\geq 2$  and knee pain on more than half the days during past month in the same knee

‡ The highest grade of school completed: tertiary (graduate degree), secondary (college graduate or some graduate school), and primary/none level (less than college)

§ Physical activity PASE score quintiles (higher scores indicate greater physical activity)