Patient Reported Outcome Measures (PROMs) in England

A Methodology for applying casemix adjustment Annex D: Coefficients for Knee Replacement Models

Annex D: Coefficients for Knee Replacement models

Table D1 gives the variables that were statistically significant at the 95% level from the estimation step and their coefficients for predicting post-operative (Q2) scores for the Knee Replacement EQ-5D Index instrument[1].

Factor	Definition	Coefficient	Standard error
Q1 score	Patient's pre-operative questionnaire score	0.396	0.013
Q1 score (squared)	Patient's pre-operative questionnaire score, squared	-0.276	0.018
Age	Patient's age	0.016	0.001
Age (squared)	Patient's age, squared	-0.00009	0.00001
Ethnicity: Black	Takes value 1 if patient is of Black ethnicity, 0 if not	-0.032	0.012
Ethnicity: Not given	Takes value 1 if patient's ethnicity is not given through HES, 0 if not	0.021	0.004
IMD (Deprivation)	The IMD (Deprivation) 2004 score for the area the patient lives in	-0.001	0.00009
Assisted at Q1	Takes value 1 if patient was assisted in completing pre-operative questionnaire, 0 if not	0.011	0.003
Assisted at Q2	Takes value 1 if patient was assisted in completing post-operative questionnaire, 0 if not	-0.087	0.005
Living arrangements: Live alone	Takes value 1 if patient lives alone, 0 if not	-0.007	0.003
Disabled at Q1	Takes value 1 if patient considers themselves to have a disability, 0 if not	-0.069	0.002
HRG Code H72	Takes value 1 if the main HRG assigned to patient's spell was H72 (v3.5), 0 if not	-0.144	0.039
Previous Surgery: Yes	Takes value 1 if patient has had previous surgery on their knee, 0 if not	-0.018	0.006
PRC: High blood pressure	Takes value 1 if patient has high blood pressure, 0 if not	0.027	0.004
PRC: Poor circulation	Takes value 1 if patient has poor circulation, 0 if not	-0.035	0.005
PRC: Lung disease	Takes value 1 if patient has lung disease, 0 if not	0.012	0.006
PRC: Diabetes	Takes value 1 if patient has diabetes, 0 if not	0.021	0.005
PRC: Kidney Disease	Takes value 1 if patient has kidney disease, 0 if not	0.024	0.009
PRC: Nervous system diseases	Takes value 1 if patient has nervous system diseases, 0 if not	-0.051	0.013
PRC: Cancer	Takes value 1 if patient has (had) cancer, 0 if not	0.025	0.007
PRC: Depression	Takes value 1 if patient has depression, 0 if not	-0.084	0.006

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[1] Note:
PRC = Patient Reported Comorbidity
HESRC = HES Reported Comorbidity

Patient has 1 HESRC	Takes value 1 if patient has one HES-reported comorbidity, 0 if not	-0.016	0.003
Patient has 2 HESRC	Takes value 1 if patient has two HES-reported comorbidities, 0 if not	-0.035	0.006
Patient has 3 HESRC	Takes value 1 if patient has three or more HES-reported comorbidities, 0 if not	-0.038	0.016
Patient has 2 PRCs	Takes value 1 if patient has self-reported exactly two comorbidities, 0 if not	-0.032	0.005
Patient has 3 PRCs	Takes value 1 if patient has self-reported exactly three comorbidities, 0 if not	-0.063	0.008
Patient has 4 PRCs	Takes value 1 if patient has self-reported four or more comorbidities, 0 if not	-0.094	0.013
Constant term		0.071	0.050

Table D1: Descriptions and coefficients of variables included in the Knee Replacement EQ-5D Index statistical prediction model for PROMs case-mix adjustment

The predicted score is found by multiplying each coefficient by the patient's response, summing the values and adding the constant term i.e. the predicted Q2 score is calculated as:

Q2predicted= 0.396*(Q1 score) - 0.276 * (Q1 score squared) + 0.016 * (Age) - 0.00009 * (Age squared) - 0.032 * (Black) + 0.021 * (Eth Not Given) - 0.001 * (IMD score) + 0.011 * (Assisted Q1) - 0.087 * (Assisted Q2) - 0.007 * (Live alone) - 0.0689 * (Disabled Q1) - 0.144 * (HRG H72) - 0.018 * (Yes Previous Surgery) + 0.027 * (High BP) - 0.035 * (Circulation) + 0.012 * (Lung Disease) + 0.021 * (Diabetes) + 0.024 * (Kidney Disease) - 0.051 * (Nervous System) + 0.025 * (Cancer) - 0.084 * (Depression) - 0.016 * (1 HES CoM) - 0.035 * (2 HES CoM) - 0.038 * (3+ HES CoM) - 0.032 * (2 Self CoM) - 0.063 * (3 Self CoM) - 0.094 * (4+ Self CoM) + 0.071

The key drivers in this model are:
- the patient's Q1 score,
- the patient's disability status,
- whether the patient has depression,
- whether the patient was assisted in completing their post-operative questionnaire,
- the patient's IMD deprivation score and
- the patient's age.

All the other factors included in the table above have a statistically significant impact on predicting post-operative scores (at a 5% level), but they are less influential in driving Q2 scores.

Knee Replacement – EQ-5D VAS

Table D2 gives the variables that were statistically significant at the 95% level from the estimation step and their coefficients for predicting post-operative (Q2) scores for the Knee Replacement EQ-5D VAS instrument.

Factor	Definition	Coefficient	Standard error
Q1 score	Patient's pre-operative questionnaire score	-0.082	0.020
Q1 score (squared)	Patient's pre-operative questionnaire score, squared	0.003	0.0002
Age	Patient's age	1.000	0.102
Age (squared)	Patient's age, squared	-0.007	0.0008
Sex: Female	Takes value 1 if patient is female, 0 if not	-0.646	0.170
Ethnicity: Asian	Takes value 1 if patient is of Asian ethnicity, 0 if not	-2.442	0.685
Ethnicity: Not given	Takes value 1 if patient's ethnicity is not given through HES, 0 if not	1.280	0.325
IMD (Deprivation)	The IMD (Deprivation) 2004 score for the area the patient lives in	-0.076	0.007
Assisted at Q2	Takes value 1 if patient was assisted in completing post-operative questionnaire, 0 if not	-6.330	0.353
Living arrangements: Live alone	Takes value 1 if patient lives alone, 0 if not	-0.706	0.207
Disabled at Q1	Takes value 1 if patient considers themselves to have a disability, 0 if not	-4.682	0.180
HRG Code H72	Takes value 1 if the main HRG assigned to patient's spell was H72 (v3.5), 0 if not	-8.708	2.807
Previous Surgery: Yes	Takes value 1 if patient has had previous surgery on their knee, 0 if not	-1.629	0.482
PRC: Heart disease	Takes value 1 if patient has heart disease, 0 if not	-0.825	0.380
PRC: High blood pressure	Takes value 1 if patient has high blood pressure, 0 if not	1.345	0.319
PRC: Poor circulation	Takes value 1 if patient has poor circulation, 0 if not	-1.791	0.407
PRC: Diabetes	Takes value 1 if patient has diabetes, 0 if not	2.017	0.401
PRC: Nervous system diseases	Takes value 1 if patient has nervous system diseases, 0 if not	-5.902	0.924
PRC: Depression	Takes value 1 if patient has depression, 0 if not	-3.760	0.418
Patient has 1 HESRC	Takes value 1 if patient has one HES-reported comorbidity, 0 if not	-2.430	0.233
Patient has 2 HESRC	Takes value 1 if patient has two HES-reported comorbidities, 0 if not	-4.029	0.473
Patient has 3 HESRC	Takes value 1 if patient has three or more HES-reported comorbidities, 0 if not	-6.498	1.157
Patient has 2 PRCs	Takes value 1 if patient has self-reported exactly two comorbidities, 0 if not	-2.164	0.371
Patient has 3 PRCs	Takes value 1 if patient has self-reported exactly three comorbidities, 0 if not	-4.564	0.630
Patient has 4 PRCs	Takes value 1 if patient has self-reported four or more comorbidities, 0 if not	-6.888	1.000
Self discharged	Takes value 1 if patient self-discharged during their spell, 0 if not	-2.869	1.439

Constant term		31.930	3.654

Table D2: Descriptions and coefficients of variables included in the Knee Replacement EQ-5D VAS statistical prediction model for PROMs case-mix adjustment

The predicted score is found by multiplying each coefficient by the patient's response, summing the values and adding the constant term i.e. the predicted Q2 score is calculated as:

*Q2predicted = -0.082 * (Q1 score) + 0.003 * (Q1 score squared) + 1.000 * (Age) - 0.007 * (Age squared) - 0.646 * (Female) - 2.442 * (Asian) + 1.280 * (Eth Not Given) - 0.076 * (IMD Score) - 6.330 * (Assisted Q2) - 0.706 * (Live alone) - 4.682 * (Disabled Q1) - 8.708 * (HRG H72) - 1.629 * (Yes Previous Surgery) - 0.825 * (Heart Disease) + 1.345 * (High BP) - 1.791 * (Circulation) + 2.017 * (Diabetes) - 5.902 * (Nervous System) - 3.760 * (Depression) - 2.430 * (1 HES CoM) - 4.029 * (2 HES CoM) - 6.498 * (3+ HES CoM) - 2.164 * (2 Self CoM) - 4.564 * (3 Self CoM) - 6.888 * (4+ Self CoM) - 2.869 * (Self discharge) + 31.930*

The key drivers in this model are:
- the patient's Q1 score,
- patient's disability status,
- whether the patient was assisted in completing their post-operative questionnaire,
- the patient's age,
- their deprivation score and
- the number of HES reported comorbidities the patient has.

All the other factors included in the table above have a statistically significant impact on predicting post-operative scores (at a 5% level), but they are less influential in driving Q2 scores.

Knee Replacement – Oxford Knee Score

Table D3 gives the variables that were statistically significant at the 95% level from the estimation step and their coefficients for predicting post-operative (Q2) scores for the Knee Replacement Oxford Knee Score instrument.

Factor	Definition	Coefficient	Standard error
Q1 score	Patient's pre-operative questionnaire score	0.681	0.023
Q1 score (squared)	Patient's pre-operative questionnaire score, squared	-0.007	0.0005
Age	Patient's age	0.585	0.051
Age (squared)	Patient's age, squared	-0.004	0.0004
Sex: Female	Takes value 1 if patient is female, 0 if not	-0.227	0.086
Ethnicity: Asian	Takes value 1 if patient is of Asian ethnicity, 0 if not	-1.877	0.320
Ethnicity: Black	Takes value 1 if patient is of Black ethnicity, 0 if not	-1.941	0.427
Ethnicity: Not given	Takes value 1 if patient's ethnicity is not given through HES, 0 if not	0.655	0.161
IMD (Deprivation)	The IMD (Deprivation) 2004 score for the area the patient lives in	-0.059	0.003
Assisted at Q1	Takes value 1 if patient was assisted in completing pre-operative questionnaire, 0 if not	0.611	0.120
Assisted at Q2	Takes value 1 if patient was assisted in completing post-operative questionnaire, 0 if not	-2.431	0.170
Living arrangements: Live alone	Takes value 1 if patient lives alone, 0 if not	-0.245	0.101
Disabled at Q1	Takes value 1 if patient considers themselves to have a disability, 0 if not	-1.866	0.091
Previous Surgery: Yes	Takes value 1 if patient has had previous surgery on their knee, 0 if not	-1.303	0.229
HRG Code H72	Takes the value 1 if the main HRG assigned to patient's spell was H72 (v3.5), 0 if not	-2.708	1.371
PRC: High blood pressure	Takes value 1 if patient has high blood pressure, 0 if not	0.822	0.155
PRC: Poor circulation	Takes value 1 if patient has poor circulation, 0 if not	-2.063	0.197
PRC: Kidney disease	Takes value 1 if patient has kidney disease, 0 if not	1.121	0.335
PRC: Cancer	Takes value 1 if patient has (had) cancer, 0 if not	0.862	0.239
PRC: Depression	Takes value 1 if patient has depression, 0 if not	-1.584	0.205
PRC: Arthritis	Takes value 1 if patient has arthritis, 0 if not	0.558	0.135
Patient has 1 HESRC	Takes value 1 if patient has one HES-reported comorbidity, 0 if not	-0.225	0.114
Patient has 2 HESRC	Takes value 1 if patient has two HES-reported comorbidities, 0 if not	-0.578	0.232
Patient has 2 PRCs	Takes value 1 if patient has self-reported exactly two comorbidities, 0 if not	-0.928	0.181
Patient has 3 PRCs	Takes value 1 if patient has self-reported exactly three comorbidities, 0 if not	-1.871	0.306
Patient has 4 PRCs	Takes value 1 if patient has self-reported four or more comorbidities, 0 if not	-2.589	0.485
Symptom period (1-5 yrs)	Takes value 1 if patient has experienced symptoms for between 1 and 5 years, 0 if not	-0.467	0.179

Constant term		4.825	1.794

Table D3: Descriptions and coefficients of variables included in the Knee Replacement Oxford Knee Score statistical prediction model for PROMs case-mix adjustment

The predicted score is found by multiplying each coefficient by the patient's response, summing the values and adding the constant term i.e. the predicted Q2 score is calculated as:

*Q2predicted = 0.681 * (Q1 score) - 0.007 * (Q1 score squared) + 0.585 * (Age) - 0.004 * (Age squared) - 0.227 * (Female) - 1.877 * (Asian) - 1.941 * (Black) + 0.655 * (Eth Not Given) - 0.059 * (IMD score) + 0.611 * (Assisted Q1) - 2.431 * (Assisted Q2) - 0.245 * (Live alone) - 1.866 * (Disabled Q1) - 1.303 * (Yes Previous Surgery) - 2.708 * (HRG H72) + 0.822 * (High BP) - 2.063 * (Circulation) + 1.121 * (Kidney Disease) + 0.862 * (Cancer) - 1.584 * (Depression) + 0.558 * (Arthritis) - 0.225 * (1 HES CoM) - 0.578 * (2 HES CoM) - 0.928 * (2 Self CoM) - 1.871 * (3 Self CoM) - 2.589 * (4+ Self CoM) - 0.467 * (Symptom 1-5 yrs) + 4.825*

The key drivers in this model are:
- the patient's Q1 score,
- patient's disability status,
- whether the patient was assisted in completing their post-operative questionnaire,
- their deprivation score,
- the patient's age and
- whether the patient has poor circulation.

All the other factors included in the table above have a statistically significant impact on predicting post-operative scores (at a 5% level), but they are less influential in driving Q2 scores.