Appendix K. Crosswalk Tables for Linking (a) Patient-Reported Outcome Measurement Information System (PROMIS)-PLUS Instruments to PROMIS Instruments and (b) Legacy Instruments to PROMIS/PROMIS-PLUS Instruments

Appendix K: Crosswalk tables for linking (a) Patient-Reported Outcome Measurement Information System (PROMIS)-PLUS instruments to PROMIS instruments and (b) legacy instruments to PROMIS/PROMIS-PLUS instruments

Introduction to Linking and Crosswalk Tables

In this study, we used the PROsetta Methodology (Patient-Reported Outcomes Rosetta Stone, "PROsetta Stone™" project) to link the Patient-Reported Outcomes Measurement Information System (PROMIS) measures with (a) new PROMIS-PLUS items developed in this study, and (b) other related "legacy" instruments, thereby expanding the range of PRO assessment options within a common, standardized metric. The methodology identifies and applies appropriate linking methods that allow scores on a range of assessment instruments to be expressed on standardized T-score metrics linked to PROMIS and, as a product of this linking, constructs score crosswalk tables for researcher and clinician use. "Linking" refers to establishing a relationship between scores on two different measures that are not necessarily designed to have the same exact item content or target population. This process of deriving equivalent scores has been used successfully in educational assessment to compare test scores obtained from parallel or alternate forms that measure the same characteristic with equal precision. Extending the technique further, comparable scores can be derived for measures of different but related characteristics.

This document contains the following crosswalk tables:

PROMIS/PROMIS-PLUS Crosswalks for Heart Failure (HF)
- *Kansas City Cardiomyopathy Questionnaire (KCCQ) Legacy Instrument to PROMIS/PROMIS-PLUS Crosswalk Table*
    - o Table 1. PROMIS Physical Function (10 items) and KCCQ Physical Limitation (6 items)

PROMIS/PROMIS-PLUS Crosswalks for Osteoarthritis of the Knee (OA-K)
- *PROMIS-PLUS to PROMIS Crosswalk Tables*
    - o Table 2. PROMIS Pain Interference (8 items) and PROMIS-PLUS Pain Interference (5 items)
    - o Table 3. PROMIS Physical Function (8 items) and PROMIS-PLUS Physical Function (5 items)

- *KOOS and WOMAC Legacy Instruments to PROMIS/PROMIS-PLUS Crosswalk Tables*
    - o Table 4. PROMIS/PROMIS-PLUS Pain Interference (8/13 items) and KOOS Pain (9 items)
    - o Table 5. PROMIS/PROMIS-PLUS Pain Interference (8/13 items) and WOMAC Pain (5 items)

Kansas City Cardiomyopathy Questionnaire (KCCQ) Legacy Instrument to PROMIS/PROMIS-PLUS Crosswalk Table (Heart Failure cross-sectional sample)

Table 1. Indirect (Raw to Raw to Scale) Equipercentile Crosswalk Table - From KCCQ Physical Limitation to PROMIS/PROMIS-PLUS Physical Function, Heart Failure cross-sectional sample

KCCQ Physical Limitation raw summed score	PROMIS/PROMIS-PLUS Physical Function scaled score (T-score metric)
6	21
7	26
8	26
9	28
10	29
11	31
12	32
13	33
14	34
15	35
16	36
17	36
18	37
19	38
20	39
21	40
22	40
23	41
24	42
25	43
26	44
27	45
28	48
29	50
30	53

Abbreviations: KCCQ is Kansas City Cardiomyopathy Questionnaire; PROMIS is Patient-Reported Outcome Measurement Information System.

Notes: KCCQ Physical Limitation raw summed scores can be crosswalked to PROMIS/PROMIS-PLUS Physical Function scaled scores, where equipercentile linking with a post-smoothing value = 0 provided the best score linking. KCCQ Physical Limitation domain includes 6 items; PROMIS/PROMIS-PLUS Physical Function domain includes 10 items.

PROMIS-PLUS to PROMIS Crosswalk Tables (OA-K cross-sectional sample)

A crosswalk table mapping each raw summed score point on PROMIS-PLUS Pain Interference to a scaled score on PROMIS Pain Interference can be useful. Based on the PROMIS-PLUS Pain Interference item parameters derived from fixed-parameter calibration, we constructed a score conversion table. The conversion table displayed below can be used to map simple raw summed scores from PROMIS-PLUS Pain Interference to T-score values linked to the PROMIS Pain Interference metric. Each raw summed score point and corresponding PROMIS scaled score are presented along with the standard error associated with the scaled score. The raw summed score is constructed such that, for each item, consecutive integers in base 1 are assigned to the ordered response categories.

Table 2. Raw Score to T-Score Conversion Table (IRT Fixed Parameter Calibration Linking) for PROMIS-PLUS Pain Interference, Osteoarthritis of the Knee cross-sectional sample

PROMIS-PLUS Pain Interference raw summed score	PROMIS Pain Interference T-score	Standard Error
5	40.2	5.9
6	47.4	2.8
7	49.8	2.2
8	51.7	2.0
9	53.3	2.0
10	54.7	2.0
11	56.1	2.0
12	57.4	2.0
13	58.7	1.9
14	60.0	1.9
15	61.1	1.9
16	62.3	1.9
17	63.4	1.9
18	64.5	1.9
19	65.7	1.8
20	66.8	1.8
21	68.0	1.9
22	69.4	2.0
23	70.9	2.2
24	73.0	2.5
25	76.6	3.7

Abbreviations: IRT is Item Response Theory; PROMIS is Patient-Reported Outcome Measurement Information System.

Note: Each raw PROMIS-PLUS summed score is presented with a corresponding PROMIS scaled score ("T-score") and standard error associated with the scaled score (read across rows). The PROMIS-PLUS Pain Interference domain includes 5 items and the PROMIS Pain Interference domain includes 8 items.

Table 3. Raw Score to T-Score Conversion Table (IRT Fixed Parameter Calibration Linking) for PROMIS-PLUS Physical Function, Osteoarthritis of the Knee cross-sectional sample

PROMIS-PLUS Physical Function raw summed score	PROMIS Physical Function T-score	Standard Error
5	17.9	3.5
6	21.0	3.2
7	23.4	3.0
8	25.4	2.8
9	27.2	2.8
10	28.8	2.7
11	30.3	2.7
12	31.8	2.7
13	33.2	2.7
14	34.6	2.7
15	36.0	2.7
16	37.4	2.7
17	38.8	2.7
18	40.2	2.7
19	41.6	2.7
20	43.1	2.7
21	44.7	2.8
22	46.5	2.9
23	48.7	3.3
24	51.5	3.7
25	58.9	6.3

Abbreviations: IRT is Item Response Theory; PROMIS is Patient-Reported Outcome Measurement Information System.

Note: Each raw PROMIS-PLUS summed score is presented with a corresponding PROMIS scaled score ("T-score") and standard error associated with the scaled score (read across rows). The PROMIS-PLUS Physical Function domain includes 5 items and the PROMIS Physical Function domain includes 8 items.

KOOS and WOMAC Legacy Instruments to PROMIS/PROMIS-PLUS Crosswalk Tables (OA-K cross-sectional sample)

Table 4. Indirect (Raw to Raw to Scale) Equipercentile Crosswalk Table - From KOOS/WOMAC Pain to PROMIS/PROMIS-PLUS Pain Interference

KOOS/WOMAC Pain raw summed scores	PROMIS/PROMIS-PLUS Pain Interference scaled scores (T-score metric)
9	42
10	46
11	48
12	49
13	51
14	52
15	52
16	53
17	54
18	55
19	56
20	57
21	58
22	59
23	60
24	60
25	61
26	62
27	62
28	64
29	65
30	66
31	67
32	68
33	68
34	69
35	70
36	71
37	72
38	74
39	74
40	75
41	76
42	77
43	78
44	78
45	79

Abbreviations: KOOS is Knee injury and Osteoarthritis Outcome Score; PROMIS is Patient-Reported Outcome Measurement Information System; WOMAC is Western Ontario and McMaster Universities Osteoarthritis Index.

Notes: KOOS/WOMAC Pain raw summed scores can be crosswalked to PROMIS/PROMIS-PLUS Pain Interference scaled scores, where equipercentile linking with a post-smoothing value = 0 provided the best score linking. The KOOS pain scale includes 9 items; 5 of which represent the WOMAC pain scale.

The combined PROMIS/PROMIS-PLUS Pain Interference domain includes a total of 13 items.

Table 5. Indirect (Raw to Raw to Scale) Equipercentile Crosswalk Table - From WOMAC Pain to PROMIS/PROMIS-PLUS Pain Interference

WOMAC Pain raw summed scores	PROMIS/PROMIS-PLUS Pain Interference scaled scores (T-score metric)
5	47
6	50
7	52
8	54
9	55
10	57
11	59
12	60
13	61
14	62
15	64
16	66
17	67
18	69
19	70
20	72
21	73
22	74
23	76
24	78
25	80

Abbreviations: PROMIS is Patient-Reported Outcome Measurement Information System; WOMAC is Western Ontario and McMaster Universities Osteoarthritis Index.

Notes: KOOS/WOMAC Pain raw summed scores can be crosswalked to PROMIS/PROMIS-PLUS Pain Interference scaled scores, where equipercentile linking with a post-smoothing value = 0.3 provided the best score linking. The WOMAC pain scale includes 5 items; the combined PROMIS/PROMIS-PLUS Pain Interference domain includes a total of 13 items.