

Supplementary Table 1. Individual PROMIS Global Health measures and scores

Please respond to each item by marking one box per row	Excellent	Very Good	Good	Fair	Poor						
1. In general, would you say your quality of life is:	5	4	3	2	1						
2. In general, how would you rate your physical health?	5	4	3	2	1						
3. In general, how would you rate your mental health, including your mood and your ability to think?	5	4	3	2	1						
4. In general, how would you rate your satisfaction with your social activities and relationships?	5	4	3	2	1						
	Completely	Mostly	Moderately	A Little	Not At All						
5. To what extent are you able to carry out your everyday physical activities such as walking, climbing stairs, carrying groceries, or moving a chair?	5	4	3	2	1						
In the past 7 days	Never	Rarely	Sometimes	Often	Always						
6. How often have you been bothered by emotional problems such as feeling anxious, depressed or irritable?	5	4	3	2	1						
	None	Mild	Moderately	Severe	Very Severe						
7. How would you rate your fatigue on average?	5	4	3	2	1						
8. How would you rate your pain on average?	0	1	2	3	4	5	6	7	8	9	10
	No										Worst
	Pain										Imaginable
											Pain

Re-scoring the pain question as: score 5 for response 0 No pain; score 4 for responses 1, 2 or 3; score 3 for responses 4, 5 or 6; score 2 for responses 7, 8 or 9; score 1 for response 10 worst pain imaginable.

Global Physical Health (GPH) raw score= Sum response scores from questions 2, 5, 7 and 8.

Global Mental Health (GMH) raw score= Sum response scores from questions 1, 3, 4 and 6.

Adapted from The Ohio State University Kemper-Gascon Global Health and Well-being Patient-Completed Health Outcome Measures. <https://www.scribd.com/document/342845011/All-Complete-Promis-10-Promis-29-Well-being-Measures-20114-4-29kk-1>

Supplementary Table 2. PROMIS Global Health raw score to T score conversion

Raw Score	GPH T score	GMH T score
4	16.2	21.2
5	19.9	25.1
6	23.5	28.4
7	26.7	31.3
8	29.6	33.8
9	32.4	36.3
10	34.9	38.8
11	37.4	41.1
12	39.8	43.5
13	42.3	45.8
14	44.9	48.3
15	47.7	50.8
16	50.8	53.3
17	54.1	56.0
18	57.7	59.0
19	61.9	62.5
20	67.7	67.6

Adapted from The PROMIS Global Health Scoring Manual.

https://www.healthmeasures.net/images/PROMIS/manuals/PROMIS_Global_Scoring_Manual.pdf

Supplementary Table 3. Factors associated with pain and fatigue among cancer survivors, Medical Expenditure Panel Survey 2016

Characteristic	Pain				Fatigue				
	Bivariate model		Multivariate model		Bivariate model		Multivariate model		
	OR (95CI)	P-value	OR (95CI)	P-value	OR (95CI)	P-value	OR (95CI)	P-value	
<i>Sociodemographic factors</i>									
Age group									
18-54	ref		ref		ref		ref		
55-64	0.83 (0.50, 1.36)	0.45	0.85 (0.48, 1.52)	0.58	0.70 (0.43, 1.14)	0.15	0.62 (0.35, 1.10)	0.10	
65-74	0.72 (0.46, 1.12)	0.14	0.52 (0.29, 0.94)	0.03	0.88 (0.56, 1.37)	0.56	0.58 (0.31, 1.06)	0.08	
≥ 75	0.88 (0.54, 1.43)	0.61	0.59 (0.30, 1.14)	0.12	0.88 (0.56, 1.38)	0.57	0.50 (0.28, 0.90)	0.02	
Sex									
Male	ref				ref				
Female	1.23 (0.87, 1.74)	0.24	--	--	1.20 (0.87, 1.66)	0.27	--	--	
Race / ethnicity									
Non-Hispanic white only	ref		ref		ref		ref		
All other race/ethnicities	1.61 (1.12, 2.33)	0.01	1.56 (1.04, 2.35)	0.03	1.18 (0.83, 1.69)	0.36	1.13 (0.75, 1.70)	0.57	
Current marital status									
Married	ref		ref		ref		ref		
Not married ^a	1.62 (1.17, 2.24)	0.004	0.94 (0.64, 1.38)	0.75	1.44 (1.06, 1.95)	0.02	0.96 (0.65, 1.41)	0.83	
Education attainment									
Less than high school graduate	ref		ref		ref		ref		
High school graduate	0.50 (0.30, 0.84)	0.009	0.74 (0.41, 1.34)	0.32	0.80 (0.48, 1.33)	0.38	1.15 (0.63, 2.08)	0.64	
Some college or more	0.38 (0.25, 0.60)	<.001	0.84 (0.49, 1.44)	0.53	0.48 (0.30, 0.76)	0.002	1.00 (0.58, 1.72)	1.00	
Family income as percent of poverty line									
Low-income ≤138%	ref		ref		ref		ref		
Middle-income 139-400%	0.58 (0.37, 0.91)	0.02	0.72 (0.44, 1.19)	0.20	0.86 (0.57, 1.29)	0.46	0.98 (0.62, 1.56)	0.93	
High-income >400%	0.23 (0.15, 0.36)	<.001	0.40 (0.23, 0.69)	0.001	0.41 (0.27, 0.61)	<.001	0.61 (0.37, 1.02)	0.06	
Health insurance coverage ^b									
Any private	ref		ref		ref		ref		
Public only	2.20 (1.51, 3.22)	<.001	1.36 (0.88, 2.10)	0.17	2.11 (1.49, 2.98)	<.001	1.42 (0.92, 2.20)	0.12	
Employment status									
Employed	ref				ref				
Retired	1.78 (1.11, 2.83)	0.02	--	--	1.69 (1.16, 2.46)	0.007	--	--	
Unable to work because ill/disabled	7.71 (4.42, 13.45)	<.001	--	--	8.42 (5.03, 14.09)	<.001	--	--	
Not working for other reasons	3.70 (2.09, 6.55)	<.001	--	--	2.49 (1.45, 4.26)	0.001	--	--	
<i>Clinical factors</i>									
Number of comorbid conditions ^c									
0	ref		ref		ref		ref		
1	1.28 (0.54, 3.04)	0.58	1.36 (0.60, 3.11)	0.46	1.21 (0.56, 2.62)	0.63	1.46 (0.72, 2.98)	0.29	
2	2.17 (0.91, 5.18)	0.08	2.65 (1.17, 6.00)	0.02	1.93 (0.88, 4.26)	0.10	2.59 (1.24, 5.37)	0.01	
3	2.22 (1.004, 4.89)	0.049	2.43 (1.17, 5.05)	0.02	2.49 (1.19, 5.18)	0.02	2.91 (1.49, 5.71)	<.001	

4	4.74 (2.14, 10.47)	<.001	4.60 (2.10, 10.05)	<.001	4.85 (2.44, 9.64)	<.001	5.30 (2.69, 10.55)	<.001	
Comorbid condition ^c									
Arthritis	2.77 (1.93, 3.97)	<.001	--	--	1.85 (1.32, 2.59)	<.001	--	--	
Asthma	2.24 (1.41, 3.56)	<.001	--	--	2.27 (1.39, 3.71)	0.001	--	--	
Diabetes	2.22 (1.42, 3.49)	<.001	--	--	2.83 (1.91, 4.20)	<.001	--	--	
Emphysema	2.39 (1.31, 4.36)	0.005	--	--	1.86 (1.02, 3.38)	0.04	--	--	
Heart disease	1.47 (1.06, 2.04)	0.02	--	--	1.99 (1.46, 2.72)	<.001	--	--	
High cholesterol	1.48 (1.07, 2.05)	0.02	--	--	1.34 (0.97, 1.84)	0.07	--	--	
Hypertension	1.70 (1.19, 2.43)	0.004	--	--	2.18 (1.56, 3.06)	<.001	--	--	
Stroke	2.25 (1.47, 3.45)	<.001	--	--	2.04 (1.23, 3.40)	0.006	--	--	
Cancer type									
Female breast only	ref		ref		ref		ref		
Prostate only	0.92 (0.52, 1.60)	0.75	0.89 (0.49, 1.64)	0.72	0.63 (0.39, 1.02)	0.06	0.64 (0.37, 1.10)	0.11	
Female other	1.62 (1.01, 2.60)	0.04	1.22 (0.69, 2.16)	0.50	1.18 (0.78, 1.79)	0.44	0.89 (0.55, 1.45)	0.65	
Male other	1.23 (0.71, 2.11)	0.46	1.23 (0.65, 2.30)	0.52	1.14 (0.70, 1.84)	0.61	1.07 (0.62, 1.85)	0.81	
Years since last cancer treatment									
<1	ref		ref		ref		ref		
1 to <5	0.91 (0.53, 1.56)	0.74	1.02 (0.55, 1.87)	0.97	1.03 (0.61, 1.75)	0.91	1.18 (0.64, 2.16)	0.59	
≥5	0.60 (0.38, 0.93)	0.02	0.61 (0.38, 0.97)	0.04	0.47 (0.31, 0.71)	<.001	0.49 (0.32, 0.75)	0.001	
Never treated / missing	0.95 (0.52, 1.75)	0.87	0.85 (0.44, 1.66)	0.64	0.40 (0.22, 0.73)	0.003	0.35 (0.18, 0.67)	0.002	
<i>Lifestyle factors</i>									
Body mass index (kg/m²)									
18.5 to 24.9	ref		ref		ref		ref		
25 to 29.9	0.88 (0.56, 1.34)	0.57	0.88 (0.52, 1.48)	0.62	1.09 (0.73, 1.62)	0.69	1.07 (0.67, 1.72)	0.79	
≥30	2.10 (1.38, 3.22)	<.001	1.59 (0.97, 2.61)	0.07	2.24 (1.48, 3.40)	<.001	1.59 (0.99, 2.56)	0.06	
Meeting physical activity guidelines ^d									
Yes	ref		ref		ref		ref		
No/unknown	2.08 (1.44, 3.01)	<.001	1.42 (0.93, 2.15)	0.10	2.87 (1.95, 4.22)	<.001	2.13 (1.37, 3.30)	<.001	
Current smoker									
No/unknown	ref		ref		ref		ref		
Yes	2.17 (1.27, 3.74)	0.005	1.47 (0.79, 2.72)	0.23	2.25 (1.28, 3.97)	0.005	1.39 (0.73, 2.63)	0.31	

Abbreviations: OR: odd ratio; 95CI: 95% confidence interval.

Logistic regression models were fitted for pain (scored 4 or more on the 10-point scale) and fatigue (rated moderate, severe or very severe vs. mild or none). In multivariable models, sex and cancer type were combined into one variable, employment status was excluded due to high collinearity with age, and number of comorbid conditions and exact comorbid conditions were included in models alternatively. "--" indicates inapplicable as the variable was not included in the multivariable models.

a Not married includes widowed, divorced, separated, or never married.

b Public insurance includes Medicare, Medicaid, and/or other public hospital/physician coverage. TRICARE/CHAMPVA was treated as private coverage, as were employer-based, union-based, and other private insurance.

c Comorbid conditions include arthritis, asthma, diabetes, emphysema, heart disease (angina, coronary heart disease, heart attack, other heart condition/disease), high cholesterol, hypertension, and stroke.

d Meeting physical activity guidelines defined by currently spending half hour or more in moderate to vigorous physical activity at least five times a week.

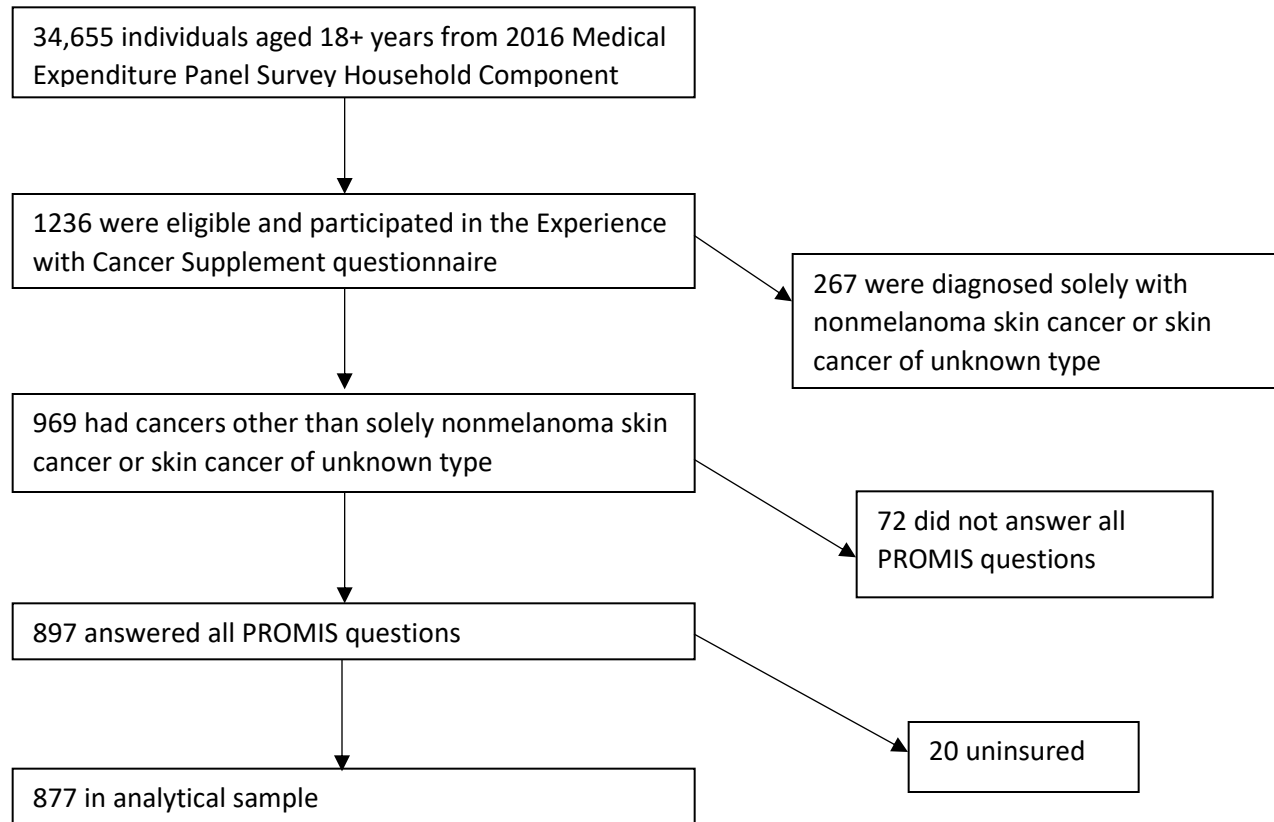
Supplementary Table 4. Adjusted associations of comorbid conditions with pain and fatigue among cancer survivors, Medical Expenditure Panel Survey 2016

Comorbid conditions	Pain		Fatigue	
	OR (95CI)	P-value	OR (95CI)	P-value
Arthritis	2.59 (1.73, 3.90)	<.001	1.58 (1.05, 2.37)	0.03
Asthma	1.44 (0.83, 2.49)	0.19	1.79 (0.98, 3.26)	0.06
Diabetes	1.50 (0.90, 2.50)	0.12	1.88 (1.24, 2.83)	0.003
Emphysema	1.56 (0.77, 3.17)	0.21	1.05 (0.47, 2.32)	0.91
Heart disease	1.05 (0.71, 1.55)	0.81	1.64 (1.09, 2.48)	0.02
High cholesterol	1.14 (0.76, 1.73)	0.53	0.88 (0.58, 1.33)	0.53
Hypertension	1.09 (0.67, 1.78)	0.73	1.64 (1.07, 2.50)	0.02
Stroke	1.58 (0.94, 2.68)	0.09	1.11 (0.64, 1.91)	0.71

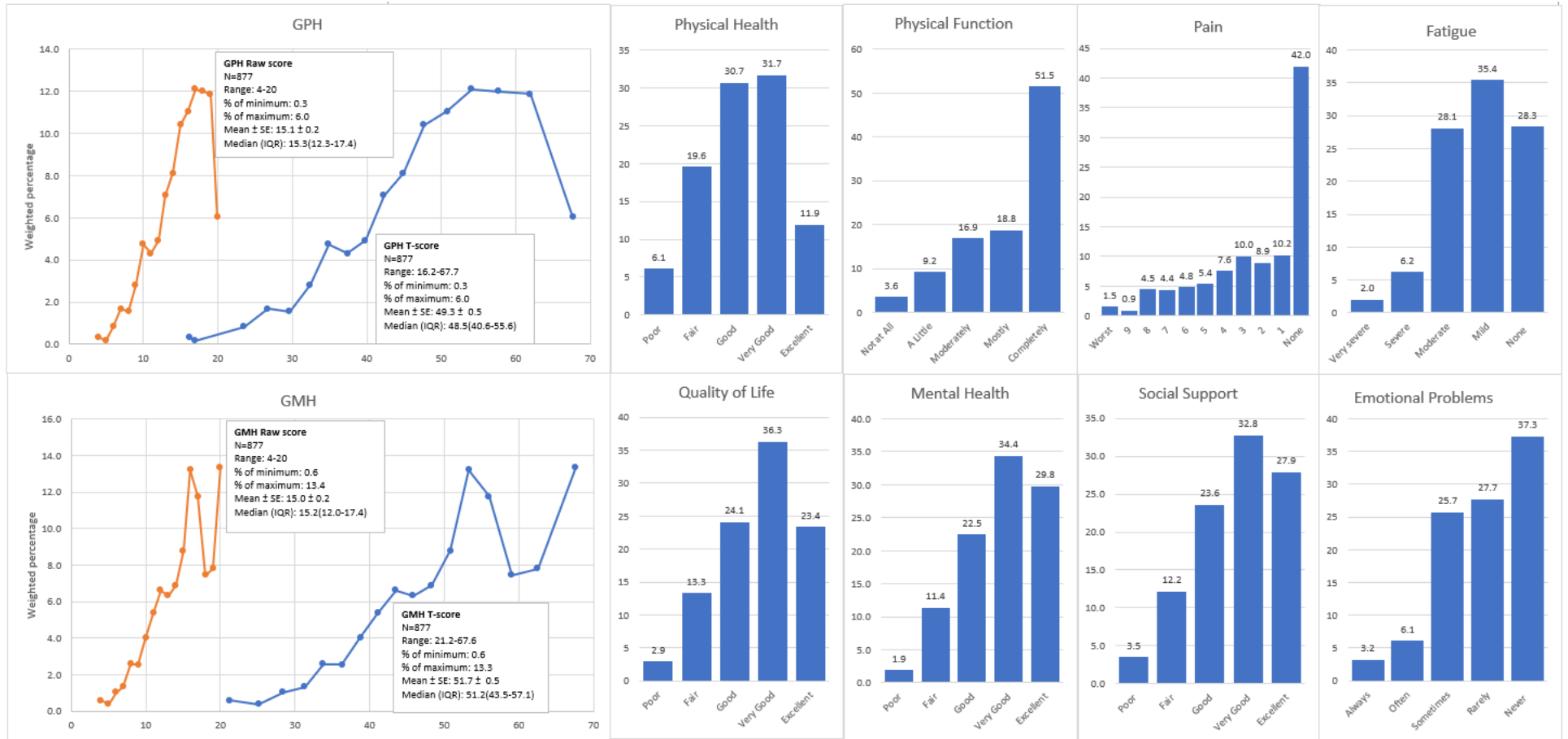
Abbreviations: OR: odd ratio; 95CI: 95% confidence interval.

Multivariable logistic regression models were fitted for pain (scored 4 or more on the 10-point scale) and fatigue (rated moderate, severe or very severe), adjusting for age group, race/ethnicity, current marital status, education, family income, health insurance, cancer type, year since diagnosis, body weight status, meeting physical activity guidelines and current smoking status.

Supplementary Figure 1. Inclusion/exclusion diagram



Supplementary Figure 2. Distribution of health-related quality of life measured by PROMIS, Medical Expenditure Panel Survey 2016



Top row: global physical health summary score and the 4 individual items; bottom row: global mental health summary score and the 4 individual items.