Determination of Normative Groups

A two-way (age X sex) analysis of variance (ANOVA) revealed significant age effects for all of the scales of the Physical Health Composite (Physical Functioning, $F = 60.53$, $p < .0001$; Role Limitations due to Physical Health Problems, $F = 14.48$, $p < .0001$; Pain, $F = 9.42$, $p < .0001$; General Health Perceptions, $F = 9.00$, $p < .0001$) and for the Emotional Well-Being Scale ($F = 13.30$, $p < .0001$). As the data in Table 4.1 show, mean raw scores for the Physical Health scales decrease with age whereas mean raw scores for the Emotional Well-Being Scale increase with age. The analysis also revealed significant sex effects for the Energy/Fatigue Scale ($F = 7.04$, $p < .008$), with female respondents reporting less energy. Sex effects were also found for the General Health Perceptions Scale ($F = 3.59$, $p < .06$), with male respondents obtaining slightly lower scores, and for the Role Limitations due to Emotional Problems Scale ($F = 3.73$, $p < .05$), with female respondents obtaining slightly lower scores. No interaction effects proved significant.

On the basis of these findings, the standardization sample of 800 was organized by age into four normative groups, with 200 participants in each group: 18–24, 25–44, 45–64, and ≥65. Additionally, a subgroup of 500, with 255 female and 245 male participants, was drawn from the large sample and stratified across age. Each of the four groups of the age-based sample and the age-stratified sample was stratified by race/ethnicity and education level to match the U.S. population proportions according to the 1993 census (U.S. Bureau of the Census; see Chapter 2). Thus, the RAND–36 HSI provides norms for seven groups for each scale: 18–24, 25–44, 45–64, ≥65, age-stratified sample ($n = 500$), age-stratified female sample ($n = 255$), and age-stratified male sample ($n = 245$). Table 4.1 provides the mean total raw scores; standard deviations (SDs); minimum, maximum, and median scores; and skewness and kurtosis values for the seven normative groups for the eight RAND–36 HSI scales.

Table 4.1. Mean Scale Raw Scores, Standard Deviations, Range Scores, and Distribution Statistics for the Seven Normative Groups

Scale	Statistic	Age-Based Sample				Age-Stratified Sample		
		18–24 (n = 200)	25–44 (n = 200)	45–64 (n = 200)	≥65 (n = 200)	Overall (n = 500)	Female (n = 255)	Male (n = 245)
Physical Functioning								
	Mean	536.08	523.92	481.12	441.81	497.29	493.38	501.35
	SD	57.78	63.87	93.03	91.21	85.80	86.46	85.10
	Minimum	209.00	257.00	222.00	209.00	209.00	209.00	209.00
	Maximum	564.00	564.00	564.00	564.00	564.00	564.00	564.00
	Median	564.00	564.00	517.00	457.50	540.00	525.00	540.00
	Skewness	–3.06	–2.01	–1.18	–0.62	–1.42	–1.33	–1.53
	Kurtosis	10.60	3.81	0.33	–0.57	1.17	0.97	1.47
Role Limitations due to Physical Health Problems								
	Mean	269.30	262.04	250.38	233.44	255.53	254.87	256.21
	SD	43.54	54.24	60.55	70.33	58.59	58.66	58.62
	Minimum	112.00	112.00	112.00	112.00	112.00	112.00	112.00
	Maximum	288.00	288.00	288.00	288.00	288.00	288.00	288.00
	Median	288.00	288.00	288.00	288.00	288.00	288.00	288.00
	Skewness	–2.46	–1.98	–1.33	–0.82	–1.60	–1.57	–1.64
	Kurtosis	5.16	2.47	0.21	–1.02	1.01	0.92	1.17
Pain								
	Mean	133.71	127.15	120.89	114.97	123.51	122.58	124.48
	SD	32.06	36.16	40.82	38.38	38.59	39.98	37.15
	Minimum	6.00	6.00	6.00	29.00	6.00	6.00	6.00
	Maximum	161.00	161.00	161.00	161.00	161.00	161.00	161.00
	Median	139.00	139.00	139.00	127.00	139.00	139.00	139.00
	Skewness	–1.44	–1.36	–0.85	–0.49	–1.04	–1.03	–1.05
	Kurtosis	2.00	1.51	–0.29	–0.89	0.27	0.22	0.32
General Health Perceptions								
	Mean	333.10	329.44	307.59	297.36	319.25	323.32	315.02
	SD	79.21	81.97	86.92	77.91	82.84	80.27	85.38
	Minimum	82.00	82.00	67.00	110.00	82.00	82.00	93.00
	Maximum	434.00	434.00	434.00	434.00	434.00	434.00	434.00
	Median	339.50	344.00	316.00	304.00	330.00	332.00	319.00
	Skewness	–0.66	–0.77	–0.45	–0.11	–0.56	–0.68	–0.44
	Kurtosis	–0.05	0.25	–0.52	–0.73	–0.25	0.07	–0.50

Table 4.1.   (Continued)

Scale	Statistic	Age-Based Sample				Age-Stratified Sample		
		18–24 (n = 200)	25–44 (n = 200)	45–64 (n = 200)	≥65 (n = 200)	Overall (n = 500)	Female (n = 255)	Male (n = 245)
Emotional Well-Being								
	Mean	235.99	239.35	253.73	274.27	251.65	247.56	255.89
	SD	67.37	70.27	73.16	58.84	66.80	67.19	66.27
	Minimum	31.00	34.00	37.00	99.00	34.00	37.00	34.00
	Maximum	361.00	361.00	361.00	361.00	361.00	361.00	361.00
	Median	241.50	251.50	276.00	279.50	266.00	262.00	276.00
	Skewness	−0.47	−0.64	−0.77	−0.59	−0.74	−0.75	−0.73
	Kurtosis	−0.03	−0.07	−0.04	−0.13	0.23	0.29	0.19
Role Limitations due to Emotional Problems								
	Mean	178.60	174.91	180.45	175.12	179.83	177.80	181.95
	SD	34.39	39.42	35.33	40.89	34.85	36.21	33.32
	Minimum	72.00	72.00	72.00	72.00	72.00	72.00	72.00
	Maximum	195.00	195.00	195.00	195.00	195.00	195.00	195.00
	Median	195.00	195.00	195.00	195.00	195.00	195.00	195.00
	Skewness	−2.07	−1.76	−2.34	−1.85	−2.24	−2.04	−2.50
	Kurtosis	3.18	1.61	4.05	1.83	3.69	2.89	4.90
Social Functioning								
	Mean	165.18	160.61	162.61	166.82	164.28	163.81	164.77
	SD	33.27	38.53	39.34	32.67	36.17	35.47	36.94
	Minimum	27.00	27.00	27.00	71.00	27.00	27.00	38.00
	Maximum	188.00	188.00	188.00	188.00	188.00	188.00	188.00
	Median	188.00	188.00	188.00	188.00	188.00	188.00	188.00
	Skewness	−1.36	−1.40	−1.60	−1.45	−1.51	−1.46	−1.56
	Kurtosis	1.15	1.07	1.65	0.97	1.39	1.32	1.50
Energy/Fatigue								
	Mean	194.80	190.85	197.29	203.37	196.62	189.25	204.29
	SD	77.77	75.39	83.72	81.21	78.96	78.22	79.15
	Minimum	5.00	5.00	5.00	5.00	5.00	5.00	5.00
	Maximum	354.00	354.00	354.00	354.00	354.00	354.00	354.00
	Median	194.50	197.50	209.00	207.00	203.50	188.00	219.00
	Skewness	−0.22	−0.27	−0.20	−0.30	−0.34	−0.25	−0.46
	Kurtosis	−0.47	−0.67	−0.80	−0.54	−0.61	−0.64	−0.50

Note. Raw scores represent IRT scoring within scale and as such are not comparable across different scales.

Standardization of Scale Raw Scores

The linear T-score transformation method was chosen for transforming raw scores to standardized scores, with a mean of 50 and standard deviation of 10. The computation of T scores for each normative group was based on the mean scores and standard deviations specific to that norm group. Table B.1 in Appendix B provides the raw-score ranges for the scales. Tables B.2–B.9 provide T-score conversions for the seven normative groups for each of the eight RAND–36 HSI scales. The linear method was chosen because the scale scores for the overall age-stratified sample were not distributed normally. The score distributions on five scales were skewed (i.e., greater than +1.00 or less than –1.00): Physical Functioning (–1.42), Role Limitations due to Physical Health Problems (–1.60), Pain (–1.04), Role Limitations due to Emotional Problems (–2.24), and Social Functioning (–1.51). The scores on the other three scales approximated a normal distribution: General Health Perceptions (–0.56), Emotional Well-Being (–0.74), and Energy/Fatigue (–0.34).

Standardization of Composite Raw Scores

Composite raw scores are based on the T scores of the four scales making up each composite. The composite raw scores were computed according to the algorithms discussed in Chapter 3. For each composite, the relevant scale T scores are multiplied by the appropriate beta weights (provided in Appendix A) and then summed to form the composite raw score. The composite raw score is then converted to a linear T score. Linear T scores are used because they preserve the underlying skewness of the score distributions. T-score equivalents of raw scores for the Physical Health, Mental Health, and Global Health composites are provided in Tables B.10, B.11, and B.12, respectively.

Cumulative Percentages for T Scores

T scores provide information on an individual's score relative to the total variability of that individual's normative group. In the instance of skewed distributions, however, a T score does not adequately reflect the relative ranking of the individual within that group. The cumulative frequency (cumulative percentage) of a particular score may be clinically significant. For instance, although a T score of 50 on the Physical Functioning Scale represents the mean T score, only 37.8% of the overall sample obtained a score equal to or less than this score, as opposed to 50% as would be the case for a sample with a normal score distribution. This point is characteristic of a skewed sample for which the mean score is lower than the median score. This finding is not surprising in a nonclinical population, for which scores on health-status instruments would be expected to cluster at the positive end of the continuum. The cumulative percentages of the seven normative groups obtaining various T scores are presented in Tables C.1–C.11 in Appendix C.