

### Reliability

The reliability of the scores on a scale reflects the extent to which the scale constitutes a homogeneous set of items (internal consistency) and the extent to which it consistently yields the same score when there is no real change in what is being measured.

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#### Reliability of Scale Scores

Cronbach's coefficient alpha (1951) was used to estimate internal consistency for the RAND-36 HSI scales. This measure reflects the degree of item covariance in relation to the number of items in the scale. This estimate of score reliability is useful for verifying whether multiple items of the same construct yield consistent information about respondents. Table 5.1 presents the reliability coefficients for the eight scales for the seven normative groups. For the overall age-stratified sample, alpha coefficients range from a low of .71 on the Social Functioning Scale to a high of .90 on the Physical Functioning Scale. Thus, for the overall age-stratified sample, all scales meet the level of internal consistency (.70) necessary for group comparisons (Nunnally, 1978), but only the Physical Functioning Scale meets the conservative level of score reliability recommended for individual-level comparisons, .90 (Nunnally, 1978). Across the age groups, the lowest alpha coefficients occurred for young adults from ages 18 to 24, with .61 on the Pain Scale and .53 on the Social Functioning Scale. This apparently lower score reliability for this age group may be due to restriction of range in the scores; compared to middle-aged and older adults, samples of young adults are likely to exhibit less variability in pain or social functioning. This hypothesis is supported by the progression of standard deviations across age groups (see Table 4.1).

**Table 5.1. Reliability Coefficients for RAND-36 HSI Scale and Composite Scores for the Seven Normative Groups**

Scale	Age-Based Sample				Age-Stratified Sample		
	18-24	25-44	45-64	≥65	Overall	Female	Male
N	200	200	200	200	500	255	245
Physical Functioning	.89	.86	.92	.89	.90	.90	.91
Role Limitations due to Physical Health Problems	.82	.89	.87	.89	.88	.88	.88
Pain	.61	.76	.77	.74	.76	.73	.74
General Health Perceptions	.80	.82	.83	.77	.81	.81	.80
Emotional Well-Being	.74	.81	.82	.68	.77	.80	.76
Role Limitations due to Emotional Problems	.77	.84	.87	.89	.83	.85	.84
Social Functioning	.53	.70	.82	.70	.71	.73	.66
Energy/Fatigue	.77	.83	.89	.87	.84	.85	.83
Physical Health Composite	.91	.94	.95	.94	.94	.94	.94
Mental Health Composite	.88	.91	.94	.88	.91	.92	.89
Global Health Composite	.93	.95	.96	.94	.95	.95	.95

Note. For the eight scales, Cronbach's (1951) alpha coefficients are reported; for the composites, reliability coefficients were computed with Mosier's (1943) formula.

### Reliability of Composite Scores

The reliability coefficients for the Physical Health, Mental Health, and Global Health composite scores are also provided in Table 5.1. The formula for the reliability of composite scores (Mosier, 1943) is a function of the reliability coefficients of the components of the composites, and the dispersions, intercorrelations, and respective weights of those component scores. Reliability coefficients for these composite scores range from a low of .88 to a high of .96 and approach or achieve the level of reliability recommended for individual-level comparison as well as for group comparison at one point in time and across time. For this reason, the three composite scores are recommended for clinical use, such as tracking an individual's health status over time.

### Test-Retest Reliability

In addition to measures of internal consistency, reliability of scores can be estimated with respect to how consistently they measure the intended construct over time. A sample of 69 participants was administered the RAND-36 HSI items on two occasions (the median test-retest interval was 7 days). Test-retest correlation coefficients for the eight scales are presented in Table 5.2. The corrected test-retest reliability coefficients for six of the scales exceed .70. For two scales, the coefficients fall below .70: Role Limitations due to Emotional Problems (.59) and Social Functioning (.61). (Calculation of the reliability coefficients for these two scales based on simple summation scoring yielded very similar results.) An examination of the distribution of scores on the Role Limitations due to Emotional Problems Scale indicated that the relatively low coefficient was the result of the small retest sample, the bipolar nature of the response options, and the nonclinical composition of the

sample. Ninety-five percent of the participants obtained the maximum score on this scale on both test and retest occasions. These scores resulted in a restricted range of variance for this sample and yielded a reliability coefficient insufficiently reflective of the true stability of scores on the Role Limitations due to Emotional Problems Scale.

**Table 5.2. Test-Retest Reliability Coefficients for RAND-36 HSI Scale and Composite Scores**

Scale/Composite	First Testing		Second Testing		Difference Score <sup>a</sup>	Obtained <i>r</i>	Corrected <i>r</i> <sup>b</sup>
	Mean	SD	Mean	SD			
Physical Functioning	50.00	9.66	49.71	10.38	-0.03	.88	.89
Role Limitations due to							
Physical Health Problems	49.61	10.51	50.96	9.99	0.13	.79	.77
Pain	50.07	11.21	52.09	9.87	0.20	.78	.72
General Health Perceptions	50.83	10.10	51.55	9.74	0.07	.90	.89
Emotional Well-Being	50.45	10.14	51.94	9.53	0.15	.80	.79
Role Limitations due to							
Emotional Problems	51.70	6.70	52.36	5.27	0.07	.11	.59
Social Functioning	50.67	10.63	51.17	9.65	0.05	.64	.61
Energy/Fatigue	49.13	10.14	51.22	10.77	0.21	.81	.81
Physical Health Composite	49.62	10.00	50.77	10.20	0.12	.89	.89
Mental Health Composite	50.42	9.62	51.97	9.09	0.16	.81	.82
Global Health Composite	49.97	9.84	51.57	9.57	0.16	.86	.87

Note: *N* = 69. Median retest interval = 7 days.

<sup>a</sup>The difference score is the difference between the mean scale or composite scores at first and second testings, divided by the standard deviation of that scale or composite obtained by the age-stratified sample (*N* = 500).

<sup>b</sup>Correlations were corrected for the variability of scores on the first testing (Guilford & Fruchter, 1978, p. 420) and calculated with the standard deviation of that scale or composite obtained by the age-stratified sample (*N* = 500).

Test-retest reliability coefficients for the three RAND-36 HSI composite scores across the seven norm groups are also provided in Table 5.2. All composite test-retest reliability coefficients consistently exceeded .80.

## Validity

The validity of the RAND-36 HSI was investigated at the item, scale, and composite levels and in relation to other measures.

### Item Level

The 36 items of the RAND-36 HSI were originally selected to maximize their associations with the long-form MOS scales from which they were derived (Ware & Sherbourne, 1992). Because the items composing each scale have not been altered from their previous versions, the relevance of each item to its respective scale and corresponding criteria of validity have been well documented elsewhere (Hays et al., 1993; McHorney, Ware, et al., 1994; McHorney et al., 1993; Ware & Sherbourne, 1992).

## Scale Level

As discussed in Chapter 1, much previous research has been conducted to establish the validity of the scales, which retain their composition of previous versions. Item-total correlations conducted with previous versions (Ware et al., 1993) are evidence of the integrity of the item composition of each scale. Earlier research on the construct-related validity of the scales has demonstrated that the scales interrelate with each other in a way that reflects underlying theoretical constructions of health status. Results of factor analyses of the SF-36 (Hays et al., 1993; Hays, Marshall, et al., 1994) provide strong support for the two-factor model of health status reported for the RAND-36 HSI. Studies of the construct validity of the RAND-36 HSI demonstrate that the two dimensions underlying the structure of health status remain intact with IRT scoring of items. Table 5.3 presents the correlation matrix of *T* scores on the Physical Health and Mental Health scales. (See Chapter 3 for a discussion of the IRT method used for deriving these scores.)

**Table 5.3. Intercorrelations of the RAND-36 HSI Scale Scores for the Age-Stratified Sample**

	Physical Functioning	Role Limitations due to Physical Health Problems	Pain	General Health Perceptions	Emotional Well-Being	Role Limitations due to Emotional Problems	Social Functioning	Energy/Fatigue
Physical Functioning	.60	.59	.59	.20	.22	.44	.41	
Role Limitations due to Physical Health Problems		.63	.55	.27	.37	.58	.47	
Pain			.59	.35	.30	.49	.48	
General Health Perceptions				.43	.28	.51	.60	
Emotional Well-Being					.49	.57	.61	
Role Limitations due to Emotional Problems						.48	.39	
Social Functioning							.52	
Energy/Fatigue								

Note. *N* = 500.

## Composite Level

Although researchers have agreed on the existence of two factors underlying the construct of health status, they have disagreed on the approach for deriving those factors and their related assumptions. Ware, Kosinski, Bayliss, et al. (1995) used a method with orthogonal rotation, assuming nonrelatedness, to derive the physical health and mental health factors, whereas Hays et al. (1993) used an oblique rotation, assuming relatedness of factors. Physical health and mental health composite scores have been derived from these factor analytic studies (Hays et al., 1993; Ware, Kosinski, Bayliss, et al., 1995). In this previous work, factor scores were based on all of the scales whether or not they loaded significantly on the factor and whether or not they were negatively loaded. As discussed previously in Chapter 3, factor analysis of the RAND-36 HSI, with scoring based on an IRT method, employed the principal axis method with oblique rotation and yielded factor pattern loadings similar to those found in the MOS studies. Table 5.4 shows the factor structure found for the overall

age-stratified sample ( $N = 500$ ). A comparison of the factor structure across age groups (not reported here) confirmed the clustering of scales on the physical health and mental health factors in the same sequence across age groups. As previously discussed, only those scales that loaded significantly on each factor were used to compute composite scores based on that factor. This method treats the factor-based estimates of the underlying physical and mental dimensions of health status in a more differentiated fashion than does the use of all eight scale scores for each factor. On the other hand, the Global Health Composite, which takes into account the variance shared by the two underlying factors, is based on all eight scale scores and, as the name suggests, is a more global reflection of health status.

**Table 5.4. Promax Factor Pattern Loadings for the RAND-36 HSI Scales**

Scale	Factor 1 Physical Health	Factor 2 Mental Health
Physical Functioning	.90	-.21
Role Limitations due to Physical Health Problems	.79	.00
Pain	.76	.02
General Health Perceptions	.63	.18
Emotional Well-Being	-.21	.95
Role Limitations due to Emotional Problems	.00	.59
Social Functioning	.30	.53
Energy/Fatigue	.24	.58

Note.  $N = 500$ . The factor analysis was based on the scores obtained by the age-stratified sample. Estimated correlation between Factors 1 and 2 was .66.

## Previous Studies

Previous research with the SF-36 scales has shown that these scales discriminate better between patients differing in the severity of medical and psychiatric conditions than corresponding long-form scales in the MOS (McHorney et al., 1992). Furthermore, the physical health measures best distinguished groups differing in severity of chronic medical illness whereas mental health measures best distinguished groups differing in the presence and severity of psychiatric disorders (McHorney et al., 1993). Results of a study in which a sample of 1,582 residents of Sheffield, England, completed both the SF-36 and the *Nottingham Health Profile* support the convergent and discriminant validity of the SF-36 (Brazier et al., 1992). Studies of the SF-36 have been reported for at least 90 disease conditions, with results demonstrating that health status scores are consistent with chronic conditions (Shiely et al., 1996). To the extent that the RAND-36 HSI retains the scales and item composition of the SF-36, this previous research substantiates item and scale relevancy of the RAND-36 HSI.

## Association of RAND-36 HSI With Other Measures

Evidence of the validity of the RAND-36 HSI scales and composites is provided by their relationships with other measures of physical health and mental health status. Various studies were conducted to demonstrate the relatedness of the Physical Health Composite and its scales to other measures of physical health, the relatedness of the Mental Health Composite

and its scales to other measures of mental health, and the correspondence of the Global Health Composite with measures of functioning that may be affected by both physical health and mental health.

### Physical Health Measures

Data from the age-stratified sample ( $N = 500$ ) was used to investigate the relationships between the RAND-36 HSI and various other indicators of physical health. Correlations between the RAND-36 HSI scale and composite scores and diagnosed disability, number of physical conditions reported, and ratings of related interference in functioning were computed for the overall sample and the female ( $n = 255$ ) and male ( $n = 245$ ) samples (see Table 5.5). As the data show, the RAND-36 HSI Physical Health Composite and scale scores correlated more highly with disability status, number of physical conditions reported, ratings of related interference in functioning than did the Mental Health Composite and scales. The Physical Health Composite score was a better predictor of these self-reported disability measures than were any of the individual Physical Health scale scores and was better than both the Mental Health and Global Health composite scores, although correlations between all three of the composite scores and self-reported disability measures were significant.

**Table 5.5. Correlations Between the RAND-36 HSI and Other Indicators of Physical Health**

Scale/Composite	Diagnosed Disability <sup>a</sup>			Physical Condition <sup>b</sup>			Total Severity <sup>c</sup>		
	Overall	Female	Male	Overall	Female	Male	Overall	Female	Male
Physical Functioning	-.39*	-.38*	-.41*	-.29*	-.24*	-.36*	-.42*	-.40*	-.46*
Role Limitations due to									
Physical Health Problems	-.36*	-.38*	-.37*	-.25*	-.16	-.39*	-.38*	-.32*	-.47*
Pain	-.36*	-.35*	-.39*	-.24*	-.18	-.31*	-.37*	-.33*	-.44*
General Health									
Perceptions	-.38*	-.32*	-.43*	-.32*	-.28*	-.39*	-.42*	-.38*	-.49*
Emotional Well-Being	-.11	-.10	-.14	-.16	-.08	-.26*	-.20*	-.13	-.30*
Role Limitations due to									
Emotional Problems	-.15	-.16	-.16	-.19*	-.13	-.29*	-.23*	-.20	-.27*
Social Functioning	-.26*	-.27*	-.26*	-.20*	-.08	-.36*	-.31*	-.21	-.44*
Energy/Fatigue	-.24*	-.23	-.28*	-.20*	-.15	-.28*	-.28*	-.23	-.35*
Physical Health Composite	-.45*	-.42*	-.48*	-.33*	-.25*	-.44*	-.48*	-.42*	-.57*
Mental Health Composite	-.23*	-.22	-.26*	-.23*	-.13	-.37*	-.31*	-.22	-.43*
Global Health Composite	-.36*	-.35*	-.39*	-.31*	-.21	-.43*	-.43*	-.35*	-.53*

Note. Data are based on the results from the age-stratified sample, which consisted of 255 female and 245 male participants.

<sup>a</sup>Diagnosed disability (Yes/No).

<sup>b</sup>Number of Physical Conditions Reported (0-25).

<sup>c</sup>Sum of 25 Physical Symptoms (0-100).

\* $p < .0001$ . All other coefficients are not significant.

## Mental Health Measures

Several studies were conducted to investigate the relationship of the RAND-36 HSI and other measures and indicators of mental health. For the first analysis, participants in the standardization ( $N = 504$ ) completed the RAND-36 HSI scales and the *Beck Depression Inventory—Second Edition* (BDI-II; Beck, Steer, & Brown, 1996), the *Beck Anxiety Inventory* (BAI; Beck & Steer, 1990), and the *Beck Hopelessness Scale* (BHS; Beck & Steer, 1988). The correlation coefficients between the RAND-36 HSI and these measures are provided in Table 5.6. Although most of the correlations achieved statistical significance, the correlations between the RAND-36 HSI Mental Health Composite and scales and the Beck measures were higher (from  $-.31$  to  $-.57$ ) than those between the RAND-36 HSI Physical Health Composite and scales and the Beck scales (from  $-.07$  to  $-.38$ ). The Mental Health Composite score was most highly correlated with the BDI-II ( $-.57$ ) and BAI ( $-.54$ ). These findings support the convergent and discriminant validity of the RAND-36 HSI scales and composites and suggest that the Mental Health Composite score is the best indicator among the RAND-36 HSI composites and scale scores of psychological symptoms of depression and anxiety.

**Table 5.6. Correlations Between the RAND-36 HSI and the BDI-II, BAI, and BHS for the Age-Stratified Sample**

<b>RAND-36 HSI Scale/Composite</b>	<b>BDI-II</b>	<b>BAI</b>	<b>BHS</b>
Physical Functioning	-.07	-.25	-.16
Role Limitations due to Physical Health Problems	-.15	-.32	-.18
Pain	-.20	-.33	-.16
General Health Perceptions	-.24	-.35	-.34
Emotional Well-Being	-.56	-.51	-.54
Role Limitations due to Emotional Problems	-.46	-.40	-.31
Social Functioning	-.46	-.41	-.37
Energy/Fatigue	-.31	-.37	-.34
Physical Health Composite	-.20	-.38	-.26
Mental Health Composite	-.57	-.54	-.52
Global Health Composite	-.46	-.53	-.45

Note.  $N = 504$ . Correlations  $\geq .25$  are significant at  $p < .01$ .

For a second analysis, a sample of 67 respondents from the standardization sample completed the RAND-36 HSI and the *Brief Symptom Inventory* (BSI; Derogatis, 1993). The correlation coefficients between these two measures are provided in Table 5.7. All correlations of .30 or greater were significant at  $p < .01$  and indicate that to some extent both physical health and mental health scales of the RAND-36 HSI are sensitive to the symptoms assessed by the BSI. Overall, the scores on the Mental Health scales were more strongly correlated with the BSI scale scores than were the Physical Health scale scores, and the Mental Health Composite score was more strongly correlated with the BSI scores than was the Physical Health Composite score. The Mental Health Composite correlations were substantially greater than the Physical Health Composite correlations with all of the BSI scales except Somatization.

**Table 5.7. Correlations Between the RAND-36 HSI and the Brief Symptom Inventory**

RAND-36 HSI Scale/Composite	Brief Symptom Inventory Scales									
	SOM	O-C	I-S	DEP	ANX	HOS	PHOB	PAR	PSY	GSI
Physical Functioning	-.54	-.33	-.28	-.45	-.35	-.24	-.37	-.30	-.27	-.41
Role Limitations due to Physical Health Problems	-.52	-.36	-.27	-.42	-.37	-.30	-.32	-.37	-.35	-.43
Pain	-.39	-.38	-.20	-.35	-.33	-.15	-.27	-.29	-.23	-.35
General Health Perceptions	-.74	-.57	-.42	-.55	-.54	-.53	-.51	-.57	-.52	-.62
Emotional Well-Being	-.60	-.55	-.56	-.69	-.64	-.59	-.56	-.61	-.64	-.66
Role Limitations due to Emotional Problems	-.47	-.65	-.55	-.71	-.56	-.53	-.46	-.52	-.63	-.65
Social Functioning	-.49	-.54	-.46	-.57	-.58	-.45	-.54	-.51	-.52	-.55
Energy/Fatigue	-.41	-.45	-.33	-.42	-.32	-.37	-.20	-.40	-.42	-.43
Physical Health Composite	-.65	-.48	-.35	-.52	-.47	-.36	-.43	-.46	-.41	-.54
Mental Health Composite	-.60	-.63	-.57	-.71	-.64	-.58	-.54	-.62	-.66	-.68
Global Health Composite	-.69	-.64	-.52	-.70	-.63	-.55	-.55	-.61	-.62	-.69

Note.  $N = 67$ . Correlations  $\geq .30$  are significant at  $p < .01$ . SOM = Somatization, O-C = Obsessive-Compulsive, I-S = Interpersonal Sensitivity, DEP = Depression, ANX = Anxiety, HOS = Hostility, PHOB = Phobic Anxiety, PAR = Paranoid Ideation, PSY = Psychoticism, GSI = Global Severity Index.

According to the results of these two studies, the RAND-36 HSI Mental Health Composite score is the strongest indicator of psychological symptoms and is perhaps slightly more reflective of depression than of other symptoms. The Global Health Composite score is a slightly less powerful indicator of psychological symptoms except with respect to somatization. Clinical implications of these findings are that the Mental Health Composite score may be used to suggest the presence of psychological symptoms where differentiation of symptoms is not important.

The relationship between perceived health status and life functioning, another basic aspect of mental health, was also investigated. For this analysis, 500 respondents from the standardization sample completed the RAND-36 HSI and the *Behavior and Symptom Identification Scale* (BASIS-32; Eisen, Dill, & Grob, 1994), a measure of mental health



functioning commonly used with psychiatric patients. The correlation coefficients between the two measures are provided in Table 5.8. The Mental Health Composite and Emotional Well-Being Scale scores both correlated very highly with the BASIS-32 Depression and Anxiety Scale score (-.72 and -.70, respectively) and the BASIS-32 Global Overall Average score (-.69 and -.68, respectively). The Mental Health Composite score correlated more highly with the BASIS-32 scale scores than did the Physical Health Composite and scale scores. Also, the BASIS-32 Daily Living/Role Functioning Scale score correlated fairly strongly with the scores on the Mental Health Composite (-.67), the Emotional Well-Being Scale (-.64), the Role Limitations due to Emotional Problems Scale (-.50), and the Social Functioning Scale (-.50). These findings are evidence of the validity of the Mental Health Composite score as a measure of mental health status and life functioning.

**Table 5.8. Correlations Between the RAND-36 HSI and the BASIS-32**

RAND-36 HSI Scale/Composite	BASIS-32 Scales					
	RE	DE	DA	IM	PS	GL
Physical Functioning	-.13	-.25	-.22	-.11	-.15	-.21
Role Limitations due to Physical Health Problems	-.20	-.35	-.28	-.18	-.13	-.28
Pain	-.29	-.38	-.34	-.27	-.17	-.35
General Health Perceptions	-.30	-.39	-.38	-.29	-.21	-.38
Emotional Well-Being	-.62	-.70	-.64	-.52	-.38	-.68
Role Limitations due to Emotional Problems	-.43	-.52	-.50	-.37	-.33	-.51
Social Functioning	-.42	-.55	-.50	-.39	-.33	-.52
Energy/Fatigue	-.42	-.50	-.49	-.34	-.24	-.48
Physical Health Composite	-.28	-.41	-.36	-.26	-.20	-.36
Mental Health Composite	-.60	-.72	-.67	-.52	-.40	-.69
Global Health Composite	-.51	-.65	-.60	-.45	-.35	-.61

Note.  $N = 500$ . Correlations  $\geq .25$  are significant at  $p < .01$ . RE = Relation to Self/Others, DE = Depression/Anxiety, DA = Daily Living/Role Functioning, IM = Impulsive/Addictive Behavior, PS = Psychosis, GL = Global/Overall Average.

The relationship between the RAND-36 HSI and the scales of the *Social Adjustment Scale-Self-Report* (SAS-SR; Weissman & Bothwell, 1976), a measure of social functioning in major life arenas, was also examined. Because both instruments are designed to reflect self-reported limitations in functioning, it was hypothesized that they would correlate highly. The correlation coefficients are reported in Table 5.9. Of the 99 intercorrelations, 77 were significant ( $p < .01$ ). The Global SAS-SR score correlated consistently with the RAND-36 HSI scores, particularly the RAND-36 HSI Mental Health Composite score (-.70). These findings suggest that there is a significant overlap in variance between self-reported health status, particularly mental health status, and self-reported social adjustment. These findings also support the underlying construct in which health status, particularly mental health status, is an important aspect of social functioning and, conversely, social functioning is an important aspect of mental health status.

**Table 5.9. Correlations Between the RAND-36 HSI and the SAS-SR**

RAND-36 HSI Scale/Composite	SAS-SR Scales								
	Work Status (n= 345)	Social & Leisure (n= 487)	Family Outside Home (n= 480)	Primary Relationship (n= 306)	Parental (n= 183)	Family Unit (n= 383)	Financial (n= 485)	Financial & Family (n= 486)	Global (n= 488)
Physical Functioning	-.25	-.19	-.03	-.25	-.07	-.17	-.13	-.12	-.23
Role Limitations due to Physical Health Problems	-.28	-.24	-.07	-.36	-.22	-.16	-.12	-.11	-.31
Pain	-.30	-.32	-.21	-.37	-.03	-.27	-.24	-.26	-.41
General Health Perceptions	-.26	-.32	-.20	-.36	-.29	-.28	-.25	-.26	-.41
Emotional Well-Being	-.29	-.60	-.46	-.44	-.42	-.53	-.40	-.48	-.68
Role Limitations due to Emotional Problems	-.40	-.38	-.25	-.28	-.42	-.31	-.25	-.25	-.45
Social Functioning	-.31	-.47	-.30	-.37	-.31	-.35	-.29	-.30	-.50
Energy/Fatigue	-.38	-.44	-.31	-.38	-.20	-.39	-.30	-.35	-.54
Physical Health Composite	-.34	-.32	-.16	-.41	-.20	-.26	-.23	-.22	-.41
Mental Health Composite	-.41	-.61	-.43	-.48	-.41	-.51	-.40	-.45	-.70
Global Health Composite	-.43	-.54	-.35	-.49	-.35	-.44	-.36	-.40	-.64

Note. Correlations  $\geq .25$  are significant at  $p < .01$ .

### Global Health Composite

Examinations of the validity of the Global Health Composite must take into account its composition and purpose. Composed of all eight scales, the Global Health Composite taps the common variance of the physical health and mental health factors. Therefore, it is not designed to be as highly related to measures of physical health as the Physical Health Composite or to measures of mental health as the Mental Health Composite. Because the Global Health Composite was formulated to tap both physical and mental aspects of health, it is the second best indicator of both. The findings reported in Tables 5.5 through 5.9 support this hypothesis. The Global Health Composite score was equally or slightly less correlated than the Physical Health Composite score but more highly correlated than the Mental Health Composite score with other measures of physical health (see Table 5.5). Likewise, the Global Health Composite score was equally or slightly less correlated than the Mental Health Composite score but more highly correlated than the Physical Health Composite score with measures of psychological symptoms (See Tables 5.6, 5.7, and 5.8) and social adjustment (Table 5.9). Correlations between the Global Health Composite score and measures of health-care resource utilization also reflect this pattern (discussed later). In summary, these findings are evidence of the validity of the Global Health Composite score as a general health indicator when only one measure is requested and in cases where differentiation of mental and physical aspects of health is not required.

### Known-Group Analyses

Discriminant function analyses using each composite score to discriminate selected criterion groups were conducted to determine the sensitivity of the RAND-36 HSI composite scores in differentiating groups of known health status. For the Physical Health Composite, two

criterion groups were chosen on the basis of the number of physical conditions reported by the respondent and the degree of reported interference in functioning related to these conditions. As described in Chapter 2, participants were asked to indicate any of 25 physical conditions that had been diagnosed for them and rate on a scale from 1 to 4 the degree to which each condition interfered with the individual's functioning. The total severity score was the sum of interference ratings across all physical conditions indicated. Criterion groups were composed of those representing the lowest quartile of self-reported limiting physical conditions ( $n = 200$ ) and those representing the highest quartile of self-reported limiting physical conditions ( $n = 200$ ). The Physical Health Composite score accurately predicted 60.5% of those reporting a high number of limiting physical conditions and 89.5% of those reporting a low number of limiting physical conditions, for a "hit" rate of 75%. Cut scores based on this classification were Physical Health Composite  $T$  scores of  $\leq 46$  for those reporting a high number of limiting physical conditions and  $T$  scores  $\geq 47$  for those reporting a low number of limiting physical conditions.

In the study of the predictive validity of the Mental Health Composite score, two sets of criterion groups were identified according to their scores on the BDI-II (Beck et al., 1996) and the BAI (Beck & Steer, 1990). For the first analysis, the *low-symptom* group was composed of respondents obtaining scores in the minimal range on either the BDI-II or the BAI ( $n = 372$ ). The *high-symptom* group was composed of respondents obtaining scores in the moderate or severe range on either the BDI-II or the BAI ( $n = 45$ ). With these criteria, the Mental Health Composite score accurately predicted 66.67% of those in the high-symptom group and 96.51% of those in the low-symptom group, with an overall hit rate of 93.3%. Cut scores based on this classification were Mental Health Composite  $T$  scores of  $\leq 38$  to identify high-symptom scorers and  $T$  scores of  $\geq 39$  to identify low-symptom scorers. A second discriminant analysis was performed, with one criterion group defined by scores on either one of the BDI-II or BAI in the mild, moderate, or severe range ( $n = 109$ ), and the other group defined by scores in the minimal range ( $n = 372$ ) on both tests. This analysis yielded a cut score of  $\geq 41$  on the Mental Health Composite, which yielded a sensitivity of 56.0% and specificity of 93.8%.

Because the Global Health Composite is composed of both physical and mental aspects of health, the criterion for the discriminant validity study could not be specific to physical or mental functioning. For this reason, the criterion for global functioning was defined by the SAS-SR (Weissman & Bothwell, 1976) Global score and the BASIS-32 (Eisen et al., 1994) Daily Living/Role Functioning score. Those scoring in the upper quartile on both scales were designated as the *low-functioning* group ( $n = 118$ ), and those who scored in the lowest quartile were designated as the *high-functioning* group ( $n = 118$ ). The Global Health Composite score accurately identified 80.5% of the low-functioning group and 92.4% of the high-functioning group for a hit rate of 86.4%. The cut scores based on this classification were Global Health Composite  $T$  scores  $\leq 49$  indicating low functioning and  $T$  scores  $\geq 50$  indicating high functioning. Clinical application of the cut scores derived in these analyses are discussed in Chapter 7.

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## Utilization of Health-Care Resources

Utilization of health-care resources is an important potential correlate of health status. Specific items about resource utilization were included in the general questionnaire

administered during standardization testing. These questions addressed self-reported frequency of office visits to a physician, sessions with a mental health counselor, admissions to an urgent care clinic or hospital emergency room, as well as hospital stays for physical or emotional problems within the previous 6 months. Reported frequencies were correlated with the RAND-36 HSI scales and composites for the age-stratified sample ( $N = 500$ ). Coefficients are reported in Table 5.10 for the overall, female, and male samples. In summary, 76% of the correlations are significant at the  $p < .01$  level or better in the predicted direction, with higher health status being associated with less reported utilization. Moreover, 61% of the correlations are significant at the  $p < .001$  level or better, and 45% are significant at the  $p < .0001$  level. These results support the hypothesized relationship between self-reported health status and reported recent use of health-care resources. More specifically, frequency of visits to a physician's office yielded significant correlations, ranging from  $-.43$  to  $-.45$ , with self-reported physical health status as measured by the Physical Health Composite score. To a lesser extent, frequency of visits to an urgent care facility was correlated with the Physical Health Composite score (ranging from  $-.24$  to  $-.34$ ), and office visits to a counselor for emotional problems were correlated with the Mental Health Composite score, but primarily for women ( $r = -.33$ ).

**Table 5.10. Correlations Between the RAND-36 HSI and Self-Reported Health-Care Resource Utilization**

Utilization	RAND-36 HSI Scale/Composite											
	PF	RLP	PA	GHP	EWB	RLE	SF	EF	PHC	MHC	GHC	
<b>Number of Visits to Physician in Last 6 Months</b>												
Overall	-.31***	-.40***	-.38***	-.35***	-.16**	-.15**	-.26***	-.24***	-.44***	-.25***	-.37***	
Female	-.27***	-.44***	-.35***	-.36***	-.16*	-.11	-.24***	-.21**	-.43***	-.23**	-.36***	
Male	-.33***	-.36***	-.42***	-.37***	-.15	-.18*	-.28***	-.25***	-.45***	-.27***	-.38***	
<b>Number of Visits to Professional Counselor for Emotional Problems in Last 6 Months</b>												
Overall	-.07	-.11*	-.17**	-.13*	-.26***	-.26***	-.23***	-.17***	-.14**	-.28***	-.25***	
Female	-.11	-.15	-.23**	-.25***	-.29***	-.38***	-.26***	-.21**	-.22**	-.33***	-.32***	
Male	-.03	-.06	-.10	-.01	-.22**	-.12	-.20*	-.13	-.06	-.22**	-.16*	
<b>Number of Visits to Urgent Care Clinic/Hospital Emergency Room in Last 6 Months</b>												
Overall	-.15**	-.24***	-.31***	-.29***	-.14**	-.08	-.20***	-.18***	-.30***	-.20***	-.27***	
Female	-.12	-.18*	-.26***	-.27***	-.17*	-.03	-.20**	-.15	-.24***	-.19*	-.24***	
Male	-.18*	-.30***	-.36***	-.30***	-.13	-.13	-.21**	-.21**	-.34***	-.22**	-.30***	
<b>Number of Hospitalizations for Physical Problems in Last 6 Months</b>												
Overall	-.24***	-.20***	-.13*	-.19***	-.06	-.15**	-.22***	-.05	-.23***	-.14*	-.20***	
Female	-.19*	-.09	-.11	-.14	-.04	-.02	-.08	-.07	-.16*	-.06	-.12	
Male	-.29***	-.30***	-.16*	-.22**	-.10	-.28***	-.35***	-.04	-.30***	-.21**	-.27***	
<b>Number of Hospitalizations for Emotional Problems in Last 6 Months</b>												
Overall	-.10	-.15**	-.18***	-.14*	-.18***	-.20***	-.20***	-.09	-.17***	-.20***	-.21***	
Female	-.11	-.15	-.19*	-.18*	-.15*	-.19*	-.21**	-.07	-.19*	-.19*	-.21**	
Male	-.07	-.16*	-.19*	-.10	-.24***	-.23**	-.22**	-.13	-.16*	-.26***	-.24**	

Note. Data are based on the age-stratified sample (N = 500), with 255 female and 245 male participants.  
\*p < .01. \*\*p < .001. \*\*\*p < .0001.