Scoring of the Veterans RAND 36 Item Health Survey (VR-36)*
(*Formerly called the Veterans SF-36)

1. The 1999 Large Health Survey of Veteran Enrollees: Methodology for Scoring the Veterans SF-36

Health status is summarized using the Veterans SF-36 (short form health survey for veterans). The Veterans SF-36 builds on a well-established widely used instrument, the Medical Outcomes Study (MOS) SF-36, which has been modified for use in VA ambulatory care patients (Ware et al. 1992 and Kazis et al. 2000).[1,2] The Veterans SF-36 measures eight concepts of health, using 37 items: *physical functioning, role limitations due to physical problems, bodily pain, general health perceptions, energy/vitality, social functioning, role limitations due to emotional problems and mental health.* Eight scales are calculated from which are derived two summary components, *a physical (PCS) and mental (MCS) component summary.* The two summaries make an important contrast between the physical and psychological health status of veteran users of the VHA. This distinction may be quite useful in understanding differences in the case mix and disease burden of patients across health care settings at the VISN and hospital or facility levels. The PCS and MCS scores provide 90% of the reliable variance in the eight Veterans SF-36 concepts.

Using independent results from the Veterans Health Study (SDR 91006.S), a prospective observational study of veteran ambulatory users, PCS and MCS scores define many more levels of health than any of the eight SF-36 scales individually and consequently provide greater precision. Distributional properties of PCS and MCS indicate no marked skewness with 0% falling at the floor or ceiling of the distributions.

Reliability estimates (internal consistency) of the PCS and MCS scales by sociodemographic characteristics (age, race, education and marital status) ranged from 0.90 to 0.95, for PCS; and 0.85 to 0.90, for MCS. PCS and MCS scores demonstrated increased precision when compared to individual scales of the MOS SF-36 and the Veterans SF-36 (Kazis 1998 and Ware et al. 1994).[3,4]

Modifications to the original MOS SF-36 include changes to the role items (role limitations due to physical and emotional problems), where response choices that were originally dichotomized two point yes/no choices are now five point ordinal choices ('no, none of the time' to 'yes, all of the time'). The changes to the SF-36 are well described and reported with increases to the precision and discriminant validity of the role scales and physical and mental component summaries (PCS and MCS).

The Veterans SF-36, adds more precision to the PCS and MCS scores when compared to the MOS SF-36, by about 5%. The questionnaire is included in appendix B. and a description of the Veterans SF-36 and its modifications are available on request in a separate technical report, *The Short Form Health Survey for Veterans (Veterans SF-36), (Kazis et al. 1999).*[5]

2. Scoring of the Veterans SF-36

There are two major steps involved in scoring and calculating the eight Veteran SF-36 scales and component summaries. The specifics are as follows:

Step One: With the exception of the role scales, scoring of all eight Veteran SF-36 scales are performed according to the standard MOS SF-36 scoring algorithms (Ware et al. 1994),[6] this includes a linear transformation from a raw score so that scores range from 0 to 100, where 100 denotes the best health. Rescoring of the seven role items from two of the scales (role limitations due to physical problems and emotional problems) use an algorithm previously developed and validated (Kazis et al.1999).[7] This involves converting the scores at the item level using a set of recodes based on the likelihood of 'yes' responses, the measures have the same mean values and variances of a veteran population who are active

users of the VHA. The means and variances are set from the Veterans Health Study (Kazis et al. 1998).[8] The conversion formulas allow for comparisons of scores to other norms and results from studies that have used the MOS version of the SF-36.

The eight scales are summarized into two components, physical and mental component summaries (PCS and MCS), each is scored using weights derived from a national U.S. probability sample. This methodology is modeled after the formulas found in the *SF-36 Physical and Mental Health Summary Scales: a Users Manual (Ware et al. 1994).*[9] Each summary is expressed as a T score with mean of 50 and a standard deviation of 10, which facilitates comparisons between VA patients and the general US population. The advantages to standardizing and norm-based scoring is that it allows for comparisons with each other and the scores have a direct interpretation in relation to the general U.S. population distribution of scores. Scores above and below 50 are above and below the average of 50 in the general U.S. population. In addition, the standard deviation is 10 for both PCS and MCS measures, therefore each one-point difference is one-tenth of a standard deviation. For example a difference of 4 points is four- tenths of a standard deviation, with a direct interpretation (see section on Interpretative Guidelines).

Step Two: Each Veteran SF-36 scale is standardized using a z-score transformation and MOS SF-36 scale means and standard deviations from the general U.S. population. This involves subtracting the general U.S. population mean from the Veterans SF-36 scale score and dividing the difference by the corresponding scale standard deviation from the general U.S. population.

Formulas for z-score standardizations of SF-36 scales:

Physical Functioning	PF_Z	= (PF - 84.52404) / 22.89490
Role Physical	RP_Z	= (RP - 81.19907) / 33.79729
Bodily Pain	BP_Z	= (BP - 75.49196) / 23.55879
General Health	GH_Z	= (GH - 72.21316) / 20.16964
Vitality	VT_Z	= (VT - 61.05453) / 20.86942
Social Functioning	SF_Z	= (SF - 83.59753) / 22.37642
Role Emotional	RE_Z	= (RE - 81.29467) / 33.02717
Mental Health	MH_Z	= (MH - 74.84212) / 18.01189

Following a z-score computation for each Veterans SF-36 scale, aggregate scores for the physical and mental components are computed using factor score coefficients computed from the general U.S. population. Formulas for aggregating standardized scales in estimating aggregate physical and mental component scores are as follows:

AGG_PHYSICAL =

(PF_Z*.42402) + (RP_Z*.35119) + (BP_Z*.31754)+
(GH_Z*.24954) + (VT_Z*.02877) +
(SF_Z*-.00753) + (RE_Z*-.19206) +
(MH_Z*-.22069)

AGG_MENTAL =

(PF_Z*-.22999) + (RP_Z*-.12329) + (BP_Z*-.09731) +
(GH_Z*-.01571) + (VT_Z*.23534) +
(SF_Z*.26876) + (RE_Z*.43407) +
(MH_Z*.48581)

The last step is to transform the components to norm-based scoring. Formulas for T-score transformation of component scores are as follows:

Transformed Physical	PCS = 50 + (AGG_PHYS*10)
Transformed Mental	MCS = 50 + (AGG_MENT*10)

Interpretative Guidelines

There are several guidelines for the interpretation of PCS and MCS scores in this report. The figures for VISN comparisons are normed to the U.S. population with a score of 50 and standard deviation of 10 for both PCS and MCS. Comparisons with other populations outside the VHA are useful as a gauge of the relative case-mix with other populations given differences in sociodemographics and comorbidities. The Medical Outcomes Study (MOS), an observational study of civilians in Boston, Los Angeles and Chicago (Tarlov et al. 1989)[11], reported age and sex adjusted mean values of *43.6 for PCS and 52.3 for MCS*. This is in contrast to overall means reported in this sample of veteran users of the VHA of *36.91 and 45.08 for PCS and MCS*, respectively. That is, veteran enrollees in this sample are more than one half a standard deviation worse for PCS and MCS than civilians in routine ambulatory care in the MOS study.

Clinical Impacts

The Veterans Health Study, an observational study of 2,425 veteran users of ambulatory care across several VA facilities in the New England Region (Kazis et al. 1998)[12] has reported the impact of comorbidities using PCS and MCS. The two tables below provide data of PCS and MCS scores indicating the unique impact of prevalent chronic conditions controlling for sociodemographics and other comorbidities. For example, the impact of having angina is a difference of 2.53 points worse (0.25 of one standard deviation) on PCS than those without angina controlling for the presence of other comorbidities. The impact of having depression is 8 points worse on MCS (0.80 standard deviations) controlling for other comorbidities. The following two tables give some interpretative guidelines for PCS and MCS scores.

Interpretative Guidelines

Average Impact of PCS Scores Observed in Veterans Health Study

Condition	Impact on PCS+
Hypertension	-0.60
Angina	-2.53
Diabetes	-3.05
Osteoarthritis	-4.78
Chronic low back pain	-5.51
Chronic lung disease	-3.57

+ Impact of disease on PCS controlling for sociodemographics and other comorbidities

Interpretative Guidelines

Average Impact of MCS Scores Observed in Veterans Health Study

Condition	Impact on MCS+
Hypertension	-0.50
Angina	-0.64
Diabetes	-0.08
Osteoarthritis	-2.05
Chronic low back pain	-2.83
Depression	-8.00
Alcohol Disorders	-6.59

+ Impact of disease on MCS controlling for sociodemographics and other comorbidities

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6. Ware et al. op cit. (1994).

7. Kazis et al. op. cit. (1999).

8. Kazis et al. op. Cit. (1998).

9. Ware et al. op. cit. (1994).