A Microcomputer Program (SF-36.EXE) that Generates SAS® Code for Scoring the SF-36™ Health Survey

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ABSTRACT

This paper describes a microcomputer, SF36.EXE, that generates SAS® code for scoring one of the most widely used measures of health-related quality of life today, the SF-36™ Health Survey. The SF-36™ Health Survey measures eight health concepts: physical functioning, bodily pain, role limitations due to physical health problems, role limitations due to personal or emotional problems, emotional well-being, social functioning, energy/fatigue, and general health perceptions. The generated SAS code derives the 8 SF-36™ scales as well as the SF-36™ physical and mental health composite scores. In addition, the program produces code that provides US general population normative scores, age and gender adjusted to one's sample. The significance of the difference between the sample and the general population on each SF-36™ scale score is also generated. Example input and output files are included.

SF-36™ and SF-36.EXE

The SF-36™ taps eight health concepts: physical functioning, bodily pain, role limitations due to physical health problems, role limitations due to personal or emotional problems, emotional well-being, social functioning, energy/fatigue, and general health perceptions. It also includes a single item that provides an indication of perceived change in health. These 36 items were adapted from longer instruments completed by patients participating in the Medical Outcomes Study (MOS), an observational study of variations in physician practice styles and patient outcomes in different systems of health care delivery (Stewart, Sherbourne, Hays, et al., 1992; Ware & Sherbourne, 1992).

We recommend that responses be scored as described below (the RAND method). A somewhat different scoring procedure for the pain and general health scales was advocated by New England Medical Center (NEMC) investigators (Ware, Snow, Kosinski, & Gandek, 1993). Although only our scoring recommendations for these scales are described here, SF36.EXE, the microcomputer program that generates the SAS® code, scores these two scales both ways. Pain scale scores scored the RAND versus NEMC way correlated 0.99 in the MOS, with a mean difference of 3.33 (NEMC scoring yields lower pain scores on average). General health perception scale scores also correlated 0.99 in the MOS, with a mean difference of -1.37 (NEMC scoring yields higher general health scores on average). For further information about the scoring differences, see Hays, Sherbourne, and Mazel (1993).

Scoring the SF-36™ is a two-step process. First, pre-coded numeric values are recoded per the scoring key given in Hays and Sherbourne (1992). All items are scored so that a high score defines a more favorable health state. In addition, each item is scored on a 0 to 100 range so that the lowest and highest possible scores are set at 0 and 100, respectively. Scores represent the percentage of total possible score achieved. In step 2, items in the same scale are averaged together to create the 8 scale scores. Items that are left blank (missing data) are not taken into account when calculating the scale scores. Hence, scale scores represent the average for all items in the scale that the respondent answered. If all items in a scale are missing, then the scale score is also missing.

As an example, items 20 and 32 are used to score the measure of social functioning. Each of the two items has 5 response choices. However, a high score (response choice 5) on item 20 indicates extreme limitations in social functioning, while a high score (response choice 5) on item 32 indicates the absence of limitations in social functioning. To score both items in the same direction, responses 1 through 5 for item 20 should be recoded to values of 100, 75, 50, 25, and 0, respectively. Responses 1 through 5 for item 32 should be recoded to values of 0, 25, 50, 75, and 100, respectively. The two recoded items are averaged together to form the social functioning scale. If the respondent is missing one of the two items, the person's score will be equal to that of the non-missing item.

To use the SF36.EXE program, it is necessary to have a SAS® dataset with the SF-36™ items in it. SF36.EXE is used in combination with the SAS® file of SF-36™ items to create SAS® code for scoring the SF-36™ scales. In addition to having SAS® dataset with SF-36™ items, the user needs to create an ASCII file that specifies the variable names that have been assigned to the 36 SF-36™ items. When SF36.EXE is executed, the user is asked for the name of the input file: WHAT FILE CONTAINS THE INPUT SETUP?

The input file consists of a list of 36 variable names, each entered on a separate row beginning in column one. The variable names need to be listed to correspond with the order of items presented in the RAND Scoring Manual (Hays & Sherbourne, 1992). For example, the first item in the RAND Scoring Manual reads "In general, would you say your health is: *Excellent, Very*

good, Good, Fair, or *Poor*?" On the first row of the input file, the variable name assigned to this item needs to be listed. The actual SAS® names are listed so that the generated SAS® code will include rename statements linking these SAS® names to the SAS® names used in the generated code (the generated code uses names I1 through I36). Note that variable names I1 through I36 should not be used for variables other than the SF-36™ items or SAS® will not be able to distinguish the SF-36™ items from these other variables.

Table 1 provides an input file for SF36.EXE. In this example, the SF-36™ items were assigned the SAS® names T1 through T36 in the study in which they were used. The input file is read by SF36.EXE and this information is used in creating an output file.

Table 1 Example Input File for SF36.EXE

```
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
T13
T14
T15
T16
T17
T18
T19
T20
T21
T22
T23
T24
T25
T26
T27
T28
T29
T30
T31
T32
T33
T34
T35
T36
```

The SF36.EXE program produces an ASCII file, SF36.SAS, that contains SAS® code for scoring the SF-36™ scales. For the pain and general health scales, both the RAND and NEMC scoring are provided. Scale scores are created for persons that answer any of the items in a scale (Note that NEMC only creates scores for person who answer half or more of the items in a scale.)

The SF36.SAS code assumes that the data-set includes a continuous measure of age (AGE) and a gender variable (MALE, coded 0 = female, 1 = male). The code also assumes that the name of the SAS® dataset that includes the SF-36™ items is "TEMP" (see SET TEMP in the generated SAS® code). If this is not the case, this part of the SF36.SAS file should be changed to reflect that. Note that a raw data file, SF36.RAW, is also produced and that this file is read by SF36.SAS when it is run. This raw data file includes information about US general population means and standard deviations (Ware et al., 1993). Output of running SF36.SAS includes US general population norms, age and gender adjusted to the sample, and internal consistency reliability estimates for the SF-36™ scales in the sample. The SF-36™ scales created include:

PHYFUN10	Physical functioning in your sample
PFISFM	Physical functioning in general population
ROLEP4	Role limitations--physical in your sample
RPSFM	Role limitations--physical in general population
PAIN2	Pain in your sample--RAND scoring
SFPAIN	Pain in your sample--NEMC scoring
BPSFM	Pain in general population
GENH5	General health in your sample--RAND scoring
SFGENH5	General health in your sample--NEMC scoring
GENSFM	General health in general population
EMOT5	Emotional well-being in your sample
MHSFM	Emotional well-being in general population
ROLEE3	Role limitations--emotional in your sample
RESFM	Role limitations--emotional in general population
ENFAT4	Energy in your sample
ENFTSFM	Energy in general population
SOCFUN2	Social function in your sample
SFSFM	Social function in general population

Table 2 illustrates the output of means, standard deviations, minimum and maximum values for each of these scales. Note that only the mean values are provided for the general population values (PFISFM, RPSFM, BPSFM, GENSFM, MHSFM, RESFM, ENFTSFM, SFSFM), because the standard deviations and ranges produced by SAS for these scales are not relevant (i.e., they are based on mean scores derived from age and gender subgroups of the general population, and are not the general population estimates of these statistics).

Table 2 Example Output from Running SF36.SAS: Part I

Variable	N	Mean	Std Dev	Minimum	Maximum
PHYFUN10	177	82.4293785	20.6300431	10.0000000	100.0000000
ROLEP4	177	90.2542373	19.4108626	0	100.0000000
PAIN2	177	84.2090395	17.3862808	25.0000000	100.0000000
SFPAIN	177	81.1242938	19.0079627	20.0000000	100.0000000
GENH5	177	73.0508475	15.3561030	25.0000000	100.0000000
SFGENH5	177	74.5423729	15.1481195	27.0000000	100.0000000
EMOT5	177	75.5706215	15.5941727	20.0000000	100.0000000
ROLEE3	177	82.2975518	29.3101553	0	100.0000000
ENFAT4	177	68.1073446	16.8197260	20.0000000	100.0000000
SOCFUN2	177	78.9548023	20.7349533	0	100.0000000

Variable	N	Mean
PFISFM	177	91.7229944
RPSFM	177	89.2180226
BPSFM	177	80.0205650
GENSFM	177	77.1684746
MHSFM	177	74.9923164
RESFM	177	83.2776836
ENFTSFM	177	63.6044633
SFSFM	177	86.0232203

In addition to the descriptive statistics, SF36.SAS provides t-statistics (asymptotically z-statistics) for the significance of the difference between SF-36™ scores in the sample compared to the US general population (ZPHY10, ZRP, ZBP, ZGENH, ZENFT, ZSF, ZRE, ZMHI). Finally, SF36.SAS outputs SF-36™ scale scores for the sample, corresponding T-scores for each scale, and the physical (AGG_PHYS) and mental health (AGG_MENT) composite T-scores (Ware, Kosinski, & Keller, 1994). The sample size and descriptive statistics provided here may differ from the prior output, because in the prior output respondents are omitted if they have missing data on age or gender (these variables are needed to adjust the general population values to one's sample). Table 3 provides an example of this additional output.

Table 3 Example Output from Running SF36.SAS: Part II

```
Variable             T  Prob>|T|
-------------------------------
ZPHY10       -6.0582746    0.0001
ZRP           0.1866498    0.8522
ZBP           0.6750584    0.5005
ZGENH        -2.4358239    0.0159
ZENFT         3.5896520    0.0004
ZSF          -4.5436598    0.0001
ZRE          -0.3998480    0.6898
ZMHI          0.5717541    0.5682
-------------------------------
```

```
Variable     N        Mean      Std Dev       Minimum        Maximum
--------------------------------------------------------------------
PHYFUN10   181   82.5138122   20.4777949   10.0000000   100.0000000
PF_T       181   49.1219757    8.9442605   17.4495019    56.7595665
ROLEP4     181   90.1933702   19.4676701            0   100.0000000
RP_T       181   52.6612489    5.7601275   25.9746802    55.5628513
SFPAIN     181   80.9779006   18.9625232   20.0000000   100.0000000
BP_T       181   52.3286173    8.0490226   26.4453268    60.4029282
SFGENH5    181   74.2430939   15.1322510   27.0000000   100.0000000
GH_T       181   51.0064304    7.5024894   27.5835563    63.7765672
EMOT5      181   75.5138122   15.5701309   20.0000000   100.0000000
EM_T       181   50.3729160    8.6443626   19.5522680    63.9673738
ROLEE3     181   81.9521179   29.7042237            0   100.0000000
RE_T       181   50.1990627    8.9938749   25.3855174    55.6636188
SOCFUN2    181   79.0055249   20.6116195            0   100.0000000
SF_T       181   47.9478374    9.2113124   12.6403464    57.3302476
ENFAT4     181   67.8453039   16.7596852   20.0000000   100.0000000
EN_T       181   53.2539351    8.0307384   30.3279008    68.6615009
AGG_PHYS   181   51.5414156    6.3803919   31.2261296    68.9868203
AGG_MENT   181   50.1132380    8.9281718   15.9550097    69.6975957
```

ACKNOWLEDGEMENTS

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SF36.EXE will be sent by electronic mail as an attachment upon request. Direct Correspondence to:

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