

Using the SAS® System to Score the SF-36® Health Survey

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ABSTRACT

The Veterans Affairs Cooperative Studies Program is using the MOS 36-Item Short Form Health Survey to measure Quality of Life in the Aneurysm Detection and Management (ADAM) Study. The New England Medical Center Hospitals publishes a coding manual on how to score the 36 items.¹ Included are instructions for scoring and recoding each item, how to code missing items, and the formula for transforming the raw scores into final scores. This paper shows the SAS code for scoring and recoding the items, an example of a patient's scores and frequencies of the scores. The higher the score, the better the patient feels.

INTRODUCTION

The 36 items are divided into eight concepts plus one health comparison question. The eight concepts to be scored are Physical Functioning (items 3a-3j), Role-Physical (items 4a-4d), Role-Emotional (items 5a-5c), Social Functioning (items 6, 10), Bodily Pain (items 7-8), Mental Health (items 9b, 9c, 9d, 9f, 9h), Vitality (items 9a, 9e, 9g, 9i), General Health Perceptions (items 1, 11a-11d), and Change in Health (item 2).

The items are all precoded as 1-2, 1-3, 1-5, or 1-6. Some of the following items have to be recoded for final scoring. Items 1, 7 & 8 require special calibration. Any out-of-range value is considered missing. Missing or blank values are estimated using the average recoded score for each concept. The raw scale scores are computed by summing across items within each concept. The raw scores are transformed to a 0 - 100 scale. The formula for the transformed scale = $[(\text{actual raw score} - \text{lowest possible raw score}) / \text{possible raw score range}] * 100$.

DEFINITIONS OF CONCEPTS

Physical Functioning (items 3a-3j) is health limitations of physical activities such as walking, climbing, bending, lifting, and moderate and

vigorous activities. The ten items are coded as 1-3. There is no recoding needed. The lowest possible raw score is 10, the highest is 30 and the range is 20.

Role Physical (items 4a-4d) is the limitations to which physical health interferes with work or other daily activities. The items are coded as 1-2. There is no recoding needed. The lowest possible raw score is 4, the highest is 8 and the range is 4.

Role Emotional (items 5a-5c) is the limitation to which emotional problems interfere with work or other daily activities. The items are coded as 1-2. There is no recoding needed. The lowest possible raw score is 3, the highest is 6 and the range is 3.

Social Functioning (items 6, 10) is the interference of normal social activities from physical health or emotional problems. The items are coded as 1-5. Item 6 is recoded as 5-1. Item 10 does not require recoding value. The lowest possible raw score is 2, the highest is 10 and the range is 8.

Bodily Pain (items 7 & 8) is the intensity of pain and effect of pain on normal work. This concept requires special coding. Item 7 is coded as 1-6 and is recoded as 6.0, 5.4, 4.2, 3.1, 2.2, 1.0. Item 8 is coded as 1-5 and is recoded as 6-1 if both item 7 and item 8 are answered. If item 7 is not answered, item 8 is recoded as 6.0, 4.75, 3.5, 2.25, 1.0. The lowest possible raw score is 2, the highest is 12 and the range is 10.

Mental Health (items 9b, 9c, 9d, 9f & 9h) is general mental health in the last 4 weeks. The items are coded as 1-6. Items 9b, 9c and 9f do not require recoding. Items 9d and 9h are recoded as 6-1. The lowest possible raw score is 5, the highest is 30 and the range is 25.

Vitality (items 9a, 9e, 9g, 9i) is feeling energetic

versus tired and worn out. The items are coded as 1-6. Items 9a and 9e are recoded as 6-1. Items 9g and 9i do not require recoding. The lowest possible raw score is 4, the highest is 24, the range is 20.

General Health Perceptions (items 1, 11a - 11d) are personal evaluations of health. The items are coded as 1-5. Items 11a and 11c do not require recoding. Items 11b and 11d are recoded as 5-1. Item 1 is recoded as 5.0, 4.4, 3.4, 2.0, 1.0. The lowest possible raw score is 5, the highest is 25 and the range is 20.

Change in Health (item 2) is comparison of current health to one year ago. Item 2 is coded as 1-5 and is recoded as 5-1. Analysis is done using a frequency and percent of patients who selected each answer.

SUMMARY

The following examples show the values of the 36 items, the recoded items and the final scores. The items that were missing in the original data are underlined and the values that appear are the imputed values. The mean and standard deviations of the final scores are shown for all the concepts.

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REFERENCES

Ware, J. E., (1993) SF-36 Health Survey Manual & Interpretation Guide, Boston: Nimrod Press

EXAMPLE OF DATA

PHYSICAL FUNCTIONING (10 items)

	I	I	I	I	I	I	I	I	I	I	P	H
	T	T	T	T	T	T	T	T	T	T	H	Y
	E	E	E	E	E	E	E	E	E	E	S	F
O	M	M	M	M	M	M	M	M	M	M	S	U
B	3	3	3	3	3	3	3	3	3	3	U	N
S	A	B	C	D	E	F	G	H	I	J	M	C
1	3	3.0	3.0	3	3	3	3	3.0	3	3	30.0	100.0
2	1	2.0	2.0	1	2	1	1	1.0	1	2	14.0	20.0
3	2	3.0	3.0	3	3	3	2	3.0	3	3	28.0	90.0
4	2	3.0	3.0	2	3	3	3	3.0	3	3	28.0	90.0
5	1	1.0	1.0	1	1	2	1	3.0	3	1	15.0	25.0
6	3	3.0	3.0	3	3	3	3	3.0	3	3	30.0	100.0
7	1	<u>1.5</u>	<u>1.5</u>	1	2	2	1	1.0	2	2	15.0	25.0
8	2	3.0	3.0	2	3	3	2	<u>2.5</u>	2	3	25.5	77.7
9	2	3.0	3.0	2	3	3	2	3.0	3	3	27.0	85.0
10	2	3.0	2.0	3	3	3	1	3.0	3	3	26.0	80.0

ROLE-PHYSICAL (4 items)

	I	I	I	I	R	R
	T	T	T	T	P	O
	E	E	E	E	H	L
O	M	M	M	M	S	H
B	4	4	4	4	U	Y
S	A	B	C	D	M	S
1	2	2	2	2	8	100
2	1	1	1	1	4	0
3	2	2	2	2	8	100
4	2	2	2	2	8	100
5	2	2	2	2	8	100
6	2	2	2	2	8	100
7	<u>1</u>	1	1	1	4	0
8	2	2	2	2	8	100
9	2	2	2	2	8	100
10	2	2	2	2	8	100

ROLE-EMOTIONAL (3 items)

	I T E M	I T E M	I T E M	R E M O S U M	R O L E E M O
O B S	5 A	5 B	5 C		
1	2	2	2	6	100.0
2	1	1	1	3	0.0
3	2	2	2	6	100.0
4	2	2	2	6	100.0
5	2	2	1	5	66.7
6	2	2	2	6	100.0
7	1	1	1	3	0.0
8	2	2	2	6	100.0
9	2	2	2	6	100.0
10	2	2	2	6	100.0

BODILY PAIN (2 items)

	I T E M	I T E M	I T E M	I T E M	B O D Y P A I N
O B S	7	7	8	8	
1	1	6.0	1	6.00	12.00 100.0
2	3	4.2	2	4.00	8.20 62.0
3	—	—	2	4.75	4.75 27.5
4	1	6.0	1	6.00	12.00 100.0
5	2	5.4	1	5.00	10.40 84.0
6	1	6.0	1	6.00	12.00 100.0
7	4	3.1	3	3.00	6.10 41.0
8	1	6.0	1	6.00	12.00 100.0
9	2	5.4	1	5.00	10.40 84.0
10	1	6.0	3	3.00	9.00 70.0

SOCIAL FUNCTIONING (2 items)

	I T E M	I T E M	I T E M	S O C I A L	S O C I A L
O B S	6	6	1	0	0
1	1	5	5	10	100.0
2	2	4	4	8	75.0
3	1	5	5	10	100.0
4	1	5	2	7	62.5
5	3	3	4	7	62.5
6	1	5	5	10	100.0
7	4	2	2	4	25.0
8	1	5	5	10	100.0
9	1	5	5	10	100.0
10	2	4	4	8	75.0

MENTAL HEALTH (5 items)

	I T E M	I T E M	I T E M	I T E M	I T E M	I T E M	M E N T A L
O B S	9	9	9	9	9	9	0
1	6	6.0	5.00	3	4	4	3 24.00 76
2	6	6.0	5.00	4	3	3	4 24.00 76
3	2	6.0	3.00	2	5	6	1 17.00 48
4	6	6.0	5.75	2	5	1	6 28.75 95
5	4	5.0	5.00	2	5	3	4 23.00 72
6	6	5.5	6.00	2	5	2	5 27.50 90
7	4	6.0	4.00	4	3	4	3 20.00 60
8	3	5.0	5.00	2	5	2	5 23.00 72
9	6	6.0	6.00	2	5	1	6 29.00 96
10	4	5.0	5.00	3	4	2	5 23.00 72

CHANGE (ITEM 2) Cumulative Frequency Percent Cumulative Frequency Percent

20	2	20.0	2	20.0
40	3	30.0	5	50.0
60	2	20.0	7	70.0
80	3	30.0	10	100.0

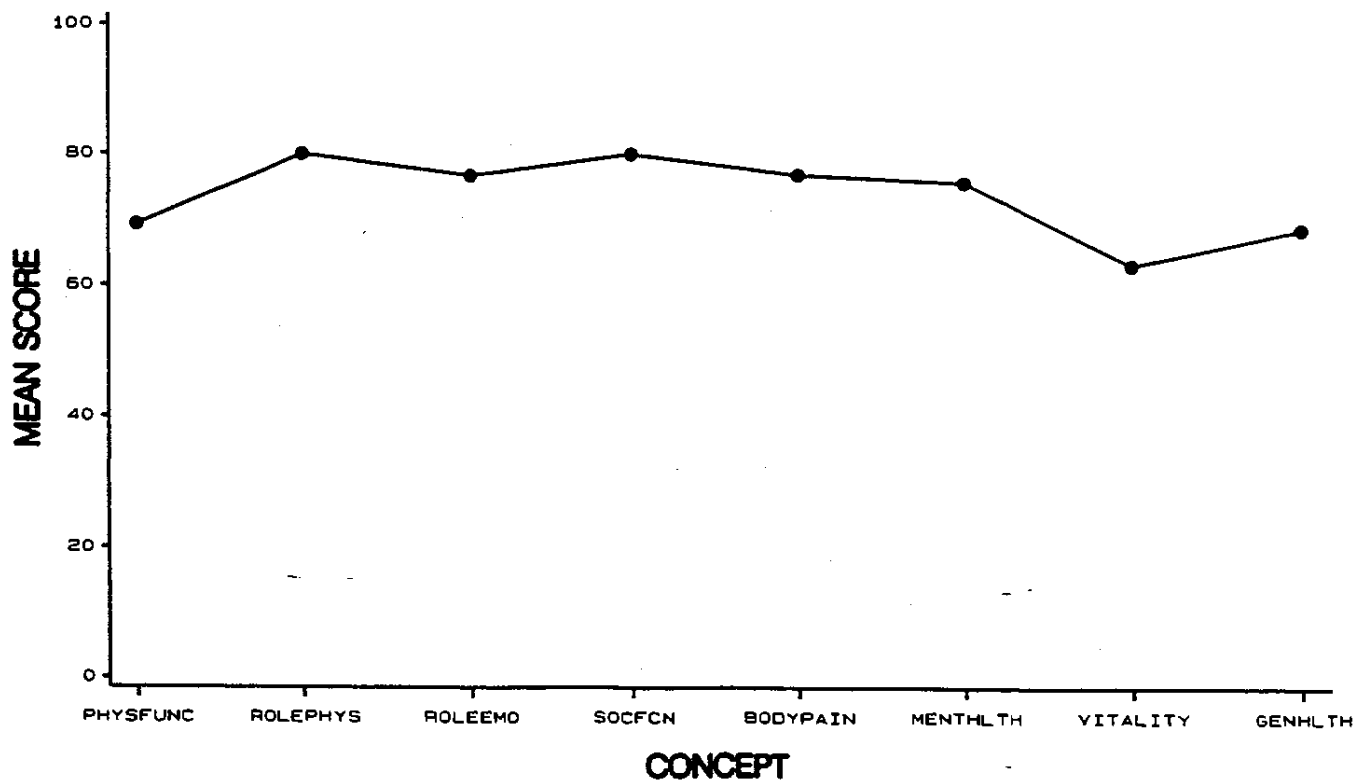
VITALITY (4 items)

GENERAL HEALTH PERCEPTIONS (5 items)

	VITALITY				GENERAL HEALTH PERCEPTIONS					GENHLTH									
	I T E M	I T E M	I T E M	I T E M	I T E M	I T E M	I T E M	I T E M	I T E M	GENHLTH									
1	4	3	4	3	4	4	14	50	1	3	3.4	3	2	4	5	2	4	19.4	72
2	4	3	4	3	5	4	15	55	2	4	2.0	4	2	4	2	4	2	14.0	45
3	6	1	6	1	6	3	11	35	3	2	4.4	4	2	4	1	2	4	17.4	62
4	3	4	2	5	5	5	19	75	4	2	4.4	5	5	1	4	1	5	19.4	72
5	2	5	2	5	4	4	18	70	5	3	3.4	4	3	3	1	2	4	15.4	52
6	2	5	2	5	6	6	22	90	6	2	4.4	4	1	5	4	1	5	22.4	87
7	6	1	6	1	3	1	6	10	7	4	2.0	3	4	2	3	3	3	13.0	40
8	2	5	1	6	5	5	21	85	8	2	4.4	5	1	5	5	2	4	23.4	92
9	2	5	2	5	6	4	20	80	9	2	4.4	4	2	4	3	2	4	19.4	72
10	3	4	1	6	5	5	20	80	10	2	4.4	5	1	5	4	1	5	23.4	92

SAMPLE MEANS AND STANDARD DEVIATIONS

Variable	N	Mean	Std Dev	Minimum	Maximum	Range
PHYSFUNC	10	69.2777778	32.5410472	20.0000000	100.0000000	80.0000000
ROLEPHYS	10	80.0000000	42.1637021	0	100.0000000	100.0000000
ROLEEMO	10	76.6666667	41.7221852	0	100.0000000	100.0000000
SOCFCN	10	80.0000000	25.1385052	25.0000000	100.0000000	75.0000000
BODYPAIN	10	76.8500000	26.3186140	27.5000000	100.0000000	72.5000000
MENTHLTH	10	75.7000000	15.0705747	48.0000000	96.0000000	48.0000000
VITALITY	10	63.0000000	25.4077853	10.0000000	90.0000000	80.0000000
GENHLTH	10	68.6000000	18.7450734	40.0000000	92.0000000	52.0000000



APPENDIX A

```
* file formh.sas *;
```

```
data main.formh;
```

```
infile in end=eof;
```

```
input card 129-130 @;
```

```
if card ne 07 then delete;
```

```
input randnum 1-6 @1 hosp 3. @7 datesf36  
mmdyy6. item1 16 item2 17 item3a 18 item3b  
19 item3c 20 item3d 21 item3e 22 item3f 23  
item3g 24 item3h 25 item3i 27 item3j 27  
item4a 28 item4b 29 item4c 30 item4d 31  
item5a 32 item5b 33 item5c 34 item6 35 item7  
36 item8 37 item9a 38 item9b 39 item9c 40  
item9d 41 item9e 42 item9f 43 item9g 44  
item9h 45 item9i 46 item10 47 item11a 48  
item11b 49 item11c 50 item11d 51 recno7  
128-130;
```

```
* Physical Functioning - missing value average;
```

```
if item3a = . then item3a = mean(item3b,  
item3c, item3d, item3e, item3f, item3g, item3h,  
item3i, item3j);
```

```
if item3b = . then item3b = mean(item3a,  
item3c, item3d, item3e, item3f, item3g, item3h,  
item3i, item3j);
```

```
if item3c = . then item3c = mean(item3a,  
item3b, item3d, item3e, item3f, item3g, item3h,  
item3i, item3j);
```

```
if item3d = . then item3d = mean(item3a,  
item3b, item3c, item3e, item3f, item3g, item3h,  
item3i, item3j);
```

```
if item3e = . then item3e = mean(item3a,  
item3b, item3c, item3d, item3f, item3g, item3h,  
item3i, item3j);
```

```
if item3f = . then item3f = mean(item3a,  
item3b, item3c, item3d, item3e, item3g, item3h,  
item3i, item3j);
```

```
if item3g = . then item3g = mean(item3a,  
item3b, item3c, item3d, item3e, item3f, item3h,  
item3i, item3j);
```

```
if item3h = . then item3h = mean(item3a,  
item3b, item3c, item3d, item3e, item3f, item3g,  
item3i, item3j);
```

```
if item3i = . then item3i = mean(item3a,  
item3b, item3c, item3d, item3e, item3f, item3g,  
item3h, item3j);
```

```
if item3j = . then item3j = mean(item3a,  
item3b, item3c, item3d, item3e, item3f, item3g,  
item3h, item3i);
```

```
* Role-Physical - missing value average;
```

```
if item4a = . then item4a = mean(item4b,
```

```
item4c, item4d);
```

```
if item4b = . then item4b = mean(item4a,  
item4c, item4d);
```

```
if item4c = . then item4c = mean(item4a,  
item4b, item4d);
```

```
if item4d = . then item4d = mean(item4a,  
item4b, item4c);
```

```
* Role-Emotional - missing value average;
```

```
if item5a = . then item5a = mean(item5b,  
item5c);
```

```
if item5b = . then item5b = mean(item5a,  
item5c);
```

```
if item5c = . then item5c = mean(item5a,  
item5b);
```

```
* Recode Social Function - item 6;
```

```
itemr6 = 6 - item6;
```

```
* Social Function - missing value average;
```

```
if itemr6 = . then itemr6 = item10;
```

```
if item10 = . then item10 = itemr6;
```

```
* Recode Body pain (item 7);
```

```
if item7 = 1 then itemr7 = 6.0;
```

```
else if item7 = 2 then itemr7 = 5.4;
```

```
else if item7 = 3 then itemr7 = 4.2;
```

```
else if item7 = 4 then itemr7 = 3.1;
```

```
else if item7 = 5 then itemr7 = 2.2;
```

```
else if item7 = 6 then itemr7 = 1.0;
```

```
* Recode item 8 and missing value average for  
item 7 & 8;
```

```
if item8 = 1 & item7 = . then itemr8 = 6.0;
```

```
else if item8 = 1 & item7 = 1 then itemr8 = 6;
```

```
else if item8 = 1 & (1 < item7 < 7) then  
itemr8 = 5;
```

```
else if item8 = 2 & item7 = . then itemr8 =  
4.75;
```

```
else if item8 = 2 & item7 ne . then itemr8 = 4;
```

```
else if item8 = 3 & item7 = . then itemr8 =  
3.5;
```

```
else if item8 = 3 & item7 ne . then itemr8 = 3;
```

```
else if item8 = 4 & item7 = . then itemr8 =  
2.25;
```

```
else if item8 = 4 & item7 ne . then itemr8 = 2;
```

```
else if item8 = 5 & item7 = . then itemr8 =  
1.0;
```

```
else if item8 = 5 & item7 ne . then itemr8 = 1;
```

```
if item8 = . then itemr8 = itemr7;
```

* Recode for mental health;

```
itemr9d = 7 - item9d;  
itemr9h = 7 - item9h;
```

* Mental health - missing value average;

```
if item9b = . then item9b = mean(item9c,  
item9f, itemr9d, itemr9h);  
if item9c = . then item9c = mean(item9b,  
item9f, itemr9d, itemr9h);  
if item9f = . then item9f = mean(item9b,  
item9c, itemr9d, itemr9h);  
if itemr9d = . then itemr9d = mean(item9b,  
item9c, item9f, itemr9h);  
if itemr9h = . then itemr9h = mean(item9b,  
item9c, item9f, itemr9d);
```

* Recode vitality;

```
itemr9a = 7 - item9a;  
itemr9e = 7 - item9e;
```

* Vitality - missing value average;

```
if itemr9a = . then itemr9a = mean(itemr9e,  
item9g, item9i);  
if itemr9e = . then itemr9e = mean(itemr9a,  
item9g, item9i);  
if item9g = . then item9g = mean(itemr9a,  
itemr9e, item9i);  
if item9i = . then item9i = mean(itemr9a,  
itemr9e, item9g);
```

* Recode general health items;

```
if item1 = 1 then itemr1 = 5.0;  
else if item1 = 2 then itemr1 = 4.4;  
else if item1 = 3 then itemr1 = 3.4;  
else if item1 = 4 then itemr1 = 2.0;  
else if item1 = 5 then itemr1 = 1.0;  
itemr11b = 6 - item11b;  
itemr11d = 6 - item11d;
```

* General Health - missing value average;

```
if itemr1 = . then itemr1 = mean(item11a,  
itemr11b, item11c, itemr11d);  
if item11a = . then item11a = mean(itemr1,  
itemr11b, item11c, itemr11d);  
if itemr11b = . then itemr11b = mean(itemr1,  
item11a, item11c, itemr11d);  
if item11c = . then item11c = mean(itemr1,  
item11a, itemr11b, itemr11d);  
if itemr11d = . then itemr11d = mean(itemr1,
```

```
item11a, itemr11b, item11c);
```

* Recode change in health;

```
itemr2 = 6 - item2;
```

* Raw scores summed across concept and transformed scale;

```
physsum = sum(of item3a item3b item3c item3d  
item3e item3f item3g item3h item3i item3j);  
physfunc = ((physsum - 10)/20) * 100;
```

```
rphysum = sum(of item4a item4b item4c  
item4d);  
rolephys = ((rphysum - 4)/4) * 100;
```

```
remosum = sum(of item5a item5b item5c);  
roleemo = ((remosum - 3)/3) * 100;
```

```
socsum = sum(of itemr6 item10);  
socfcn = ((socsum - 2)/8) * 100;
```

```
bodsum = sum(of itemr7 itemr8);  
bodypain = ((bodsum - 2)/10) * 100;
```

```
mhsum = sum(of item9b item9c item9f itemr9d  
itemr9h);  
menthlth = ((mhsum - 5)/25) * 100;
```

```
vitsum = sum(of itemr9a itemr9e item9g item9i);  
vitality = ((vitsum - 4)/20) * 100;
```

```
gensum = sum(of itemr1 item11a itemriib  
item11c itemr11d);  
genhlth = ((gensum - 5)/20) * 100;
```

```
run;
```