ABSTRACT
SAS code is presented which provides an alternate reporting scheme for factor analysis output. This alternate format is intended to be more "user friendly"; that is, directly interpretable by the non-technical analyst. An example is included for review.

INTRODUCTION
The user of factor analysis generally reviews a matrix of factor loadings, underlining those loadings above a certain value, in order to name the dimensions. The number of dimensions is usually decided upon by a combination of a rule of thumb, either the "scree" test or the "eigenvalue" rule, and commonsense judgment (Urban and Hanser, 1980). Commonsense judgment, which usually requires interpreting at least one more and one less factor solutions than provided by the rule of thumb, depends on the interpretability of the factor structure. We have found that the non-technical analyst often finds this task unnecessarily time consuming and that the possibility exists of failing to include a high loading variable in the factor through oversight. The SAS code in Appendix A is designed to automate this procedure although the decision on the number of dimensions is left with the analyst.

ALTERNATIVE OUTPUT
The alternative output is placed after the normal PROC FACTOR output, which is not suppressed. Each factor is placed on a separate page, with the pages sequenced from most to least explained variance. On each page the total explained variance and the variance explained by the factor is reported. Variables which load on that factor are listed, with labels and factor loadings, in descending order of the factor loadings. The analyst can choose the loading level to be utilized. Any other factor on which the variable loads is listed to the right of the variable label so that the analyst can quickly see if a variable loads on more than one factor. After all factor pages are printed, a final report lists all variables which do not load on any factor along with the factor on which the variable had its highest loading. See Appendix B for an example with the first two pages and a final page printed.

Appendix B is actually the result of two different runs. In the first run the loading factor was set artificially low to show the capabilities of printing out additional factor loadings on the first two pages of the example. In the second run the loading factor was set artificially high in order to provide an example of variables which did not load for the last page example.

REFERENCES

Appendix A

DATA INPUT;
INFILE DATABASE;
INPUT ID 1-4 a99(PGR1-PGR23);

PROC FACTOR METHOD=PRIN SCREE ROTATE=VARIMAX SCORE OUT=RATEFACT NFACT=6;
VAR PGR1-PGR23;

PROC SUMMARY DATA=INPUT2; VAR EXPVAR; OUTPUT OUT=TOT SUM=TOTEXVAR;
DATA SUM1; SET;

DATA COMBINE; MERGE INPUT2 SUM1; BY CODE;

DATA INPUT; SET;
THIS DATA STEP SETS THE FACTOR LOADING CUTOFF. SET ABS(XXX) GE N TO THE DESIRED LEVEL WHERE XXX IS YOUR ARRAY NAME. CHANGE ARRAY STATEMENT TO REFLECT THE CORRECT NUMBER OF ELEMENTS. CHANGE TITLE IN THE REPORTS TO REFLECT THE CUTOFF LEVEL THAT YOU USE.

*-----------------------------------------------------*
*RENAME _NAME_=FACTOR; ARRAY PGRI(PGR); DO OVER PGR; LOAD=0; LOAD=PGR; N=I; Q='V'; M=INPUT(N,$12.); ATTRIB=Q; OUTPUT; END; DATA LISTVARKEEP=ATTRIB FACTOR LOAD EXPVAR); SET COMBINE; RENAME _NAME_=FACTOR; ARRAY PGR(I) PGRI-PGRZ3; DO OVER PGR; LOAD=0; LOAD=PGR; N=I; Q='V'; M=INPUT(N,$12.); ATTRIB=Q; OUTPUT; END; PROC SORT; BY ATTRIB FACTOR; DATA LISTVAR: SET; BY ATTRIB; IF FIRST.ATTRIB=1 THEN LOADI=LOAD; IF FIRST.ATTRIB=1 THEN FACTORI=FACTOR; IF FIRST.ATTRIB=1 THEN EXPVARI=EXPVAR; RETAIN LOADI; RETAIN FACTORI; RETAIN EXPVARI; IF ABS(LOAD) GT ABS(LOADI) THEN DO; LOADI=LOAD; FACTORI=FACTOR; EXPVARI=EXPVAR; END; IF LAST.ATTRIB=1; KEEP FACTOR FACTORI LOAD EXPVARI; PROC SORT DATA=INPUT; BY ATTRIB; DATA NONLOADKEEP=ATTRIB FACTORI LOAD EXPVARI); MERGE LISTVAR(IN=INE) INPUT(IN=INC); BY ATTRIB; IF FIRST.ATTRIB; IF INE=1 AND INC=0; PROC SORT; BY DESCENDING EXPVARI; DATA FACT(KEEP=FACTORI LOADI EXPVARI); FACTZ(KEEP=FACTORI LOADI EXPVARI); FACT3(KEEP=FACTORI LOADI EXPVARI); FACT4(KEEP=FACTORI LOADI EXPVARI); FACT5(KEEP=FACTORI LOADI EXPVARI); *----------------------------------------------------------------~

THIS PROGRAM IS SET TO HANDLE LOADINGS ON UP TO 5 FACTORS FOR EACH VARIABLE. IF A VARIABLE LOADS ON MORE THAN 5 FACTORS THEN EXPAND THIS SECTION. HOWEVER, I SUGGEST THAT SOMETHING IS WRONG WITH YOUR DATA OR YOUR LOADING CUTOFF IS SET TOO LOW IF YOUR VARIABLES ARE LOADING ON MORE THAN 5 FACTORS.

*-----------------------------------------------------*
*SET INPUT; BY ATTRIB; IF FIRST.ATTRIB=1 THEN COUNT=0; RETAIN COUNT; COUNT=COUNT+1; IF COUNT=1 THEN OUTPUT FAC1; IF COUNT=2 THEN OUTPUT FAC2; IF COUNT=3 THEN OUTPUT FAC3; IF COUNT=4 THEN OUTPUT FAC4; IF COUNT=5 THEN OUTPUT FAC5; IF LAST.ATTRIB=1; DATA INPUT3; SET INPUT; BY ATTRIB; IF FIRST.ATTRIB=1 THEN COUNT=0; RETAIN COUNT; COUNT=COUNT+1; IF LAST.ATTRIB=1; KEEP ATTRIB COUNT; DATA FAC1(KEEP=FACTOR LOADI COUNT LOAD); FAC2(KEEP=FACTOR LOADI COUNT LOAD); FAC3(KEEP=FACTOR LOADI COUNT LOAD); FAC4(KEEP=FACTOR LOADI COUNT LOAD); FAC5(KEEP=FACTOR LOADI COUNT LOAD); KEEP FACTOR LOADI COUNT LOAD; DATA INPUT4; MERGE INPUT INPUT3; BY ATTRIB; DATA; MERGE INPUT4 FAC1 FAC2 FAC3 FAC4 FAC5; BY ATTRIB; PROC FORMAT; *YOU MUST PUT IN YOUR VARIABLE LABELS IN THE FOLLOWING SECTION*;

VALUE SATT
V1='VARIETY OF SERVICES AVAILABLE'
V2='APPOINTMENTS ON SHORT NOTICE'
V3='REFERRAL PROCEDURES'
V4='KNOWLEDGE AND ABILITY OF FAMILY DOCTORS'
V5='KNOWLEDGE AND ABILITY OF MED SPECIALISTS'
V6='LOCATION OF FACILITIES'
V7='ROUTINE APPOINTMENT TIME'
V8='PARKING AT FACILITIES'
V9='FREEDOM TO CALL AT ALL HOURS'
V10='GETTING CARE WITHOUT AN APPOINTMENT'
V11='THOROUGHNESS OF PHYSICAL EXAMS'
V12='AMOUNT OF PRIVACY IN DOCTORS OFFICE'
V13='DOCTORS ATTENTION TO PERSONAL PROBLEMS'
V14='TIME SPENT WAITING IN DOCTORS OFFICE'
V15='APPEARANCE LAYOUT DESIGN OF FACILITIES'
V16='DOCTORS PROVIDE EXPLANATIONS/ANS QUEST'
V17='FRIENDLINESS OF NURSES RECEIVE ADMIN'
V18='FRIENDLINESS AND COURTESY OF DOCTORS'

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PROC SORT;
   BY DESCENDING EXPVAR DESCENDING LOAD;
DATA: SET; BY DESCENDING EXPVAR;
FILE PRINT HEADER=TOP NOTITLES;
IF FIRST.EXPVAR THEN DO;
   PUT ~RT;
   IF COUNT=1 THEN PUT 31 ATTRIB 36 ATTRIB $ATT. 349 LOAD 6.3 /;
   IF COUNT=2 AND FACTOR=F1 THEN PUT 31 ATTRIB 36 ATTRIB $ATT. 349 LOAD 6.3 366 F2 274 L2 6.3 /;
   IF COUNT=2 AND FACTOR=F2 THEN PUT 31 ATTRIB 36 ATTRIB $ATT. 349 LOAD 6.3 366 F1 274 L1 6.3 /;
   IF COUNT=3 AND FACTOR=F1 THEN PUT 31 ATTRIB 36 ATTRIB $ATT. 349 LOAD 6.3 366 F2 274 L2 6.3 /
      366 F3 299 L3 6.3 /;
   IF COUNT=3 AND FACTOR=F2 THEN PUT 31 ATTRIB 36 ATTRIB $ATT. 349 LOAD 6.3 366 F1 274 L1 6.3 /
      366 F2 299 L2 6.3 /;
   IF COUNT=3 AND FACTOR=F3 THEN PUT 31 ATTRIB 36 ATTRIB $ATT. 349 LOAD 6.3 366 F1 274 L1 6.3 /
      366 F2 299 L2 6.3 366 F3 299 L3 6.3 /;
   IF COUNT=4 AND FACTOR=F1 THEN PUT 31 ATTRIB 36 ATTRIB $ATT. 349 LOAD 6.3 366 F2 274 L2 6.3 /
      366 F3 299 L3 6.3 366 F4 3106 L4 6.3 /;
   IF COUNT=4 AND FACTOR=F2 THEN PUT 31 ATTRIB 36 ATTRIB $ATT. 349 LOAD 6.3 366 F1 274 L1 6.3 /
      366 Fl 374 L1 6.3 382 F4 3106 L4 6.3 /;
   IF COUNT=4 AND FACTOR=F3 THEN PUT 31 ATTRIB 36 ATTRIB $ATT. 349 LOAD 6.3 366 F1 274 L1 6.3 /
      366 F2 299 L2 6.3 366 F3 299 L3 6.3 382 F4 3106 L4 6.3 /;
   RETURN;
*-----------------------------------------------------------*
I CHANGE HEADING LINE TO REFLECT n FACTOR SOLUTION.
I CHANGE HEADING LINE TO REFLECT PROPER FACTOR LOADING USED.
I CHANGE TITLE FOR THE TOP OF EACH PAGE.
*-----------------------------------------------------------*
TOP:
DATA: SET NONLOAD;
FILE PRINT HEADER=TOP NOTITLES;
IF COUNT=1 THEN PUT 31 ATTRIB 36 ATTRIB $ATT. 349 LOAD 6.3 /;
RETURN;
Appendix B

SATISFACTION DIMENSIONS
FACTOR ANALYSIS FOR HMO MEMBERS 1983
6 FACTOR SOLUTION

TOTAL EXPLAINED VARIANCE = 60.98391 PERCENT

FACTOR 1

VARIABLE | FACTOR LOADING | THIS VARIABLE ALSO LOADS ON THE FOLLOWING FACTORS AT .3 |
--- | --- | --- |
V16 DOCTORS PROVIDE EXPLANATIONS/ANS QUES | 0.755 | FACTOR2 0.306 |
V13 DOCTORS ATTENTION TO PERSONAL PROBLEMS | 0.755 | FACTOR4 0.372 |
V5 KNOWLEDGE AND ABILITY OF MED SPECIALISTS | 0.732 | FACTOR3 0.368 |
V18 FRIENDLINESS AND COURTESY OF DOCTORS | 0.730 | FACTOR2 0.506 |
V4 KNOWLEDGE AND ABILITY OF FAMILY DOCTORS | 0.718 | FACTOR2 0.400 |
V11 THOROUGHNESS OF PHYSICAL EXAMS | 0.602 | FACTOR5 0.593 |
V3 REFERRAL PROCEDURES | 0.482 | FACTOR2 0.339 |
V12 AMOUNT OF PRIVACY IN DOCTORS OFFICES | 0.461 | FACTOR2 0.400 |
V17 FRIENDLINESS OF NURSES RECEP ADMIN | 0.380 | FACTOR5 0.409 |
V22 NUMBER OF DOCTORS TO CHOOSE FROM | 0.352 |
### SATISFACTION DIMENSIONS

**FACTOR ANALYSIS FOR HMO MEMBERS 1983**

**6 FACTOR SOLUTION**

**TOTAL EXPLAINED VARIANCE = 60.98391 PERCENT**

**FACTOR2**

**VARIANCE EXPLAINED BY THIS FACTOR = 10.79765 PERCENT**

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>FACTOR LOADING</th>
<th>FACTOR LOADING</th>
<th>FACTOR LOADING</th>
<th>FACTOR LOADING</th>
<th>FACTOR LOADING</th>
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</thead>
<tbody>
<tr>
<td>V8 PARKING AT FACILITIES</td>
<td>0.716</td>
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<tr>
<td>V15 APEEARANCE LAYOUT DESIGN OF FACILITIES</td>
<td>0.622</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>V19 FORMS AND PAPERWORK</td>
<td>0.588</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V12 AMOUNT OF PRIVACY IN DOCTORS OFFICES</td>
<td>0.506</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V14 TIME SPENT WAITING IN DOCTORS OFFICE</td>
<td>0.489</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V17 FRIENDLINESS OF NURSES RECEP ADMIN</td>
<td>0.400</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V22 NUMBER OF DOCTORS TO CHOOSE FROM</td>
<td>0.339</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V18 FRIENDLINESS AND COURTESY OF DOCTORS</td>
<td>0.306</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This variable also loads on the following factors at .3:

- FACTOR5 0.333
- FACTOR1 0.461
- FACTOR3 0.427
- FACTOR1 0.386
- FACTOR3 0.393
- FACTOR1 0.352
- FACTOR5 0.409
- FACTOR1 0.730
### HMO SATISFACTION DIMENSION STUDY

**THE FOLLOWING VARIABLES DO NOT LOAD ON ANY FACTOR AT .6**

This variable loads highest on factor with the given loading.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Factor</th>
<th>Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>V3</td>
<td>Referral Procedures</td>
<td>Factor 1</td>
<td>0.4822664</td>
</tr>
<tr>
<td>V12</td>
<td>Amount of Privacy in Doctors Offices</td>
<td>Factor 2</td>
<td>0.5057346</td>
</tr>
<tr>
<td>V14</td>
<td>Time Spent Waiting in Doctors Office</td>
<td>Factor 2</td>
<td>0.4887451</td>
</tr>
<tr>
<td>V17</td>
<td>Friendliness of Nurses Recep Admin</td>
<td>Factor 2</td>
<td>0.4008064</td>
</tr>
<tr>
<td>V19</td>
<td>Forms and Paperwork</td>
<td>Factor 2</td>
<td>0.5883925</td>
</tr>
<tr>
<td>V23</td>
<td>Emergency Care Procedures</td>
<td>Factor 4</td>
<td>0.5976979</td>
</tr>
<tr>
<td>V22</td>
<td>Number of Doctors to Choose From</td>
<td>Factor 5</td>
<td>0.4096799</td>
</tr>
</tbody>
</table>