The following is an overview of software for the CMS-HCC risk-adjustment model. The software includes a SAS program – **V1212F1P** that calls several SAS Macros to create HCC score variables using coefficients from the following regression models:

- Community
- Institutional
- New enrollee
- SNP new enrollee.

The set of SNP new enrollee coefficients is applicable to enrollees in Chronic Disease Special Needs Plans (SNP) only. These coefficients account for the fact that all new enrollees in these plans have one of the medical conditions required for SNP enrollment.

## Software description

The software consists of a main program V1212F1P that supplies user parameters to the main SAS Macro program V1212F1M. This macro program reads in two input files and assigns HCCs for each person. First, the program crosswalks diagnoses to Condition Categories (CCs) using SAS formats which were previously stored in the FORMAT library. Then the program creates Hierarchical Condition Categories (HCCs) by imposing hierarchies on the CCs. For persons without claims, zeros are assigned to all HCCs. After HCCs are created the program computes predicted scores from 4 regression models.

The main macro V1212F1M uses 6 external SAS Macro programs:

- %AGESEXNV - create age/sex, originally disabled, disabled variables
- %EDITICD9 - perform edits to ICD9 codes
- %V12H70M - assign one ICD9 code to multiple CCs
- %V12H70L1 - assign labels to HCCs
- %V12H70H - set HCC=0 according to hierarchies
- %SCOREVAR - calculate a score variable

The main program, main macro and 6 external macros have a .txt extension to make the files easier to view. Please rename them to have .sas extension before running the software.

Steps performed by the software:

```
step1: include external macros
step2: define internal macro variables
step3: merge person and diagnosis files outputting one
       record per person for each input person level
       record
       step3.1: declaration section
       step3.2: bring in regression coefficients
       step3.3: merge person and diagnosis files
       step3.4: for the first record for a person set CC
                to 0 and create person's age
       step3.5: if there are any diagnoses for a person
                then do the following:
       - create CC using format $I12121Y11Y12YC from
         format library
       - perform ICD9 edits using macro EDITICD9
       - create additional CC using V12H70M macro
       step3.6: for the last record for a person do the
                following:
       - create demographic variables needed for score
         calculation (macro AGESEXNV)
       - create HCC using hierarchies (macro V12H70H)
       - create HCC interaction variables
       - create HCC and disabled interaction variables
       - set HCCs and interaction vars to zero if there
         are no diagnoses for a person
       - create score for community model
       - create score for institutional model
       - create score for new enrollee model
       - create score for SNP new enrollee model
step4: data checks and proc contents
```

**PART 1.** Files supplied by the software.

The following SAS programs and files are included in this software:

- **V1212F1P –** main program that has all the parameters supplied by a user (see below for parameter and variable list). It calls main macro V1212F1M
- **V1212F1M** - main macro that creates HCC and SCORE variables by calling other external macros
- **AGESEXNV** - create age/sex, originally disabled, disabled variables
- **EDITICD9** - performs edits to ICD9 code
- **V12H70M** - assigns ICD9 diagnosis code to multiple CCs where required

- **V12H70L1** - assigns labels to HCCs
- **V12H70H** - sets HCC=0 according to hierarchies
- **SCOREVAR** - calculates a score variable
- **F1212H1Y.TXT –** a txt version of the format that has a cross-walk from ICD9 codes to CC categories (use for reference only).
- **F1212H1Y -** format library that has a cross-walk from ICD9 codes to V12 CC categories that are transformed to HCC categories by the software. Contains only codes fully valid in FY11-FY12.
- **C1210F1Y –** coefficients for 4 regression models; 3 of them (community, institutional, new enrollee) developed with CMS denominator 7463.14 (2/12/2008).

The last 2 files are SAS transport files, which may be used on any platform running SAS, after uploading and converting using PROC CIMPORT. Users should use the following code to convert them.

Code for converting coefficients transport file to SAS file:

```
filename inc  "C:\user defined location of the transport file\C1210F1Y";
libname incoef  "C:\user defined location of the sas coefficients file";
proc cimport data=incoef.hcccoefn infile=inc;
run;
```

Code for converting formats transport file to SAS file:

```
filename inf  "C:\user defined location of the transport file\F1212H1Y";
libname library  "C:\user defined location of the sas formats file";
proc cimport library=library infile=inf;
run;
```

If you are operating in an MVS environment, the transport files should be uploaded using the following parameters: RECFM(F or FB) LRECL(80) BLKSIZE(8000)

**PART 2.** Files supplied by a user.

Two SAS input files needed for the software must be presorted in ascending order by the person ID variable

1) **PERSON** file--a person-level file of demographic and enrollment information
2) **DIAG** file--a diagnosis-level input file of diagnoses

Data requirements for the SAS input files. The variable names listed are required by the programs as written:

1) **PERSON** file
   - **HICNO** (or other person identification variable. It must be set in the macro variable IDVAR)
     -character or numeric type and unique to an individual

   - **SEX**
     -one character, 1=male; 2=female

   - **DOB**
     - SAS date format, date of birth

   - **MCAID**
     -numeric, =1 if number of State Part B BUYIN (MEDICAID)Months of *base* year >0,
     =0 otherwise

   - **NEMCAID**
     -numeric, =1 if a new enrollee and number of State Part B BUYIN (MEDICAID) months of *payment* year >0;
     =0 otherwise

   - **OREC**
     -one character, original reason for entitlement with the following values:
     0 - OLD AGE (OASI)
     1 - DISABILITY (DIB)
     2 - ESRD
     3 - BOTH DIB AND ESRD

2) **DIAG** file--a diagnosis file with at least one record per person-specific unique diagnosis.
   - **HICNO** (or other person identification variable that must be the same as in PERSON file)
     - person identifier of character or numeric type and unique to an individual

- **DIAG**
  - ICD-9-CM diagnosis code, 5 character field, no periods, left justified. The user may include all diagnoses or limit the codes to those used by the model. Codes should be to the greatest level of available specificity. Diagnoses should be included **only** from providers and physician specialties as provided in prior notices.

**Part 3**. Parameters supplied by a user:

*NOTE: All user-supplied parameters should be reentered by the user. The default settings are examples only, and should not be used.*

The user must supply the following:

- **INP** - SAS input person dataset name
- **IND** - SAS input diagnosis dataset name
- **OUTDATA** - SAS output dataset name
- **IDVAR** - name of person identifier variable (HICNO for Medicare data)
- **KEEPVAR** - variables kept in the output dataset. There is a list of KEEP variables in the program, but the user can alter the list.
- **SEDITS** - a switch that controls whether to perform edits on ICD9
  1-YES, 0-NO
- **DATE_ASOF -** reference date to calculate age. Set to February 1 of the payment year for consistency with CMS. The default value in this version of the software is February 1, 2012.

**Part 4**. Variables output by the software.
The software outputs a person level file. Any variables that the user wants to keep in it should be specified in the main program **V1212F1P** in **KEEPVAR** parameter of macro **V1212F1M** call. The following variables can be specified:

1) Any person level variables from the original person level file
2) Demographic variables created by the software and listed in the main program **V1212F1P** by the macro variable **&DEMVARS:**
   **AGEF ORIGDS DISABL**
   **F0_34 F35_44 F45_54 F55_59 F60_64 F65_69**
   **F70_74 F75_79 F80_84 F85_89 F90_94 F95_GT**

**M0_34  M35_44 M45_54 M55_59 M60_64 M65_69**
**M70_74 M75_79 M80_84 M85_89 M90_94 M95_GT**
**NEF0_34  NEF35_44 NEF45_54 NEF55_59 NEF60_64**
**NEF65  NEF66  NEF67  NEF68  NEF69**
**NEF70_74 NEF75_79 NEF80_84 NEF85_89 NEF90_94**
**NEF95_GT**
**NEM0_34  NEM35_44 NEM45_54 NEM55_59 NEM60_64**
**NEM65  NEM66  NEM67  NEM68  NEM69**
**NEM70_74 NEM75_79 NEM80_84 NEM85_89 NEM90_94**
**NEM95_GT**

3) **HCC**s defined in the main program **V1212F1P** by the macro variable &**CMSHCC**
4) **CC**s (condition categories assigned before hierarchies are applied) defined in the main program **V1212F1P** by the macro variable **&CMSCC**
5) Score variables:
    - **SCORE_COMMUNITY –** community model
    - **SCORE_INSTITUTIONAL –** institutional model
    - **SCORE_NEW_ENROLLEE –** new enrollees model
    - **SCORE_SNP_NEW_ENROLLEE –** new enrollee model for Chronic Disease SNP plans only

The user should determine which of the scores is appropriate for the beneficiary depending upon the status of that beneficiary.