The following is an overview of the software for the Version 22 CMS-HCC risk-adjustment model. The software includes a SAS program – **V2217O1P** that calls several SAS Macros to create HCC score variables using coefficients from the following regression models:

- Community – Non-dual aged
- Community – Non-dual disabled
- Community – Full Benefit dual aged
- Community – Full Benefit dual disabled
- Community – Partial Benefit dual aged
- Community – Partial Benefit dual disabled
- Institutional
- New enrollee
- C-SNP new enrollee.

The set of C-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 C-SNP enrollment.

Software description

The software consists of a main program V2217O1P that supplies user parameters to the main SAS Macro program V2217O1M. 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 9 regression models.

The main macro V2217O1M uses 5 external SAS Macro programs:

- %AGESEXV2 - create age/sex, originally disabled, disabled variables
- %V22I0ED2 – perform edits to ICD10 codes
- %V22H79L1 - assign labels to HCCs
- %V22H79H1 - set HCC=0 according to hierarchies
- %SCOREVAR - calculate a score variable

The main program, main macro and 5 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
           CCs to 0 and create person's age
           step3.5: if there are any diagnoses for a person
                       then do the following:
           - perform diagnosis edits using macro V22I0ED2
           - create CCs using format provided in format
           library
           - create additional CCs using additional formats
           provided in format library
           step3.6: for the last record for a person do the
             following:
           - create demographic variables needed for score
             calculation (macro AGESEXV2)
           - create HCCs using hierarchies (macro V22H79H1)
           - create HCCs interaction variables
           - create HCCs and disabled interaction variables
           - set HCCs and interaction vars to zero if there
             are no diagnoses for a person
           - create scores for 6 community models
           - create score for institutional model
           - create score for new enrollee model
           - create score for C-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:

- **V2217O1P –** main program that has all the parameters supplied by a user (see below for parameter and variable list). It calls main macro V2217O1M
- **V2217O1M** - main macro that creates HCC and SCORE variables by calling other external macros
- **AGESEXV2** - create age/sex, originally disabled, disabled variables
- **V22I0ED2** - performs edits to ICD10 code. Medicare Code Editor (MCE) is source of edits
- **V22H79L1** - assigns labels to HCCs
- **V22H79H1** - sets HCC=0 according to hierarchies
- **SCOREVAR** - calculates a score variable
- **F2217O1P.TXT** – a txt version of the format that has a cross-walk from ICD10 codes to V22 CC categories (use for reference only). This format contains ICD10 codes valid in FY2016/FY2017.
- **F2217O1P** - format library containing all the formats for the software.
- **C2214O5P** – relative coefficients for 9 regression models developed using CY2013/2014 data and CMS denominator $9,185.29 (CMS 3/6/2016).

Format library and coefficients file 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\C2214O5P";
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\F2217O1P";
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 – z/OS 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

- **LTIMCAID**
  -numeric, =1 if number of months in Medicaid in *payment* year >0;
  =0 otherwise

- **NEMCAID**
  -numeric, =1 if a new Medicare enrollee and number of months in Medicaid in *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**
  -Diagnosis code, 7 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 acceptable sources, depending on whether you are using RAPS submission or encounter data.

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 MCE edits on ICD10
        1-YES, 0-NO
- **DATE_ASOF** – reference date to calculate age. Set to February 1 of the payment year for consistency with CMS.

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 **V2217O1P** in **KEEPVAR** parameter of macro **V2217O1M** 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:
   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 **V2217O1P** by the macro variable &**HCCV22_list79**
4) **CC**'s (condition categories assigned before hierarchies are applied) defined in the main program **V2217O1P** by the macro variable &**CCV22_list79**
5) Score variables:
   - **SCORE_COMMUNITY_NA –** community model Non Dual Aged
   - **SCORE_COMMUNITY_ND –** community model Non Dual Disabled
   - **SCORE_COMMUNITY_FBA –** community model Full Benefit Dual Aged
   - **SCORE_COMMUNITY_FBD –** community model Full Benefit Dual Disabled
   - **SCORE_COMMUNITY_PBA –** community model Partial Benefit Dual Aged
   - **SCORE_COMMUNITY_PBD –** community model Partial Benefit Dual Disabled
   - **SCORE_INSTITUTIONAL –** institutional model
   - **SCORE_NEW_ENROLLEE –** new enrollee model
   - **SCORE_SNP_NEW_ENROLLEE –** new enrollee model for Chronic Disease SNP plans only

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