

The following is an overview of software for the CMS-ESRD risk-adjustment model.

#### Software Description.

The software includes a SAS program - **E2120P2P** that calls several SAS Macros to create HCC score variables using coefficients from the following regression models:

- CMS-HCC Dialysis
- CMS-HCC Dialysis for New Enrollees
- CMS-HCC Community for Functioning Graft
- CMS-HCC Institutional for Functioning Graft
- CMS New enrollee for Functioning Graft.

The software consists of a main program, **E2120P2P**, which supplies user parameters to the main SAS Macro program **E2120P2M**. This Macro program reads in two input files and assigns HCCs for each person.

The program first crosswalks diagnoses to Condition Categories (CCs), using SAS formats which were previously stored in the FORMAT library. The program then creates Hierarchical Condition Categories (HCCs) by imposing hierarchies on the CCs. For persons without claims, zeros are assigned to all HCCs.

The program contains a modified version of the CMS-HCC model for persons who have functioning kidney grafts. This model, based on the model for the general population, excludes HCCs for kidney transplant status and dialysis status but includes add-on payments depending on months post transplant.

After HCCs are created the program computes predicted scores from the five regression models.

The main Macro, **E2120P2M**, uses 5 external SAS Macro programs:

- %AGESEV2 - create age/sex, originally disabled, disabled variables
- %V21I0ED3 - perform edits to ICD10 codes
- %V20H87L1 - assign labels to HCCs
- %V20H87H1 - 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 CC 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 V21I0ED3
        - create CC using format provided in format library
        - create additional CC 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
    AGESEV2)
    - create HCC using hierarchies (macro V20H87H1)
    - create HCC interaction variables
    - create HCC by non-aged interaction variables
    - set to 0 HCCs and interaction variables if there are no diagnoses for a
    person
    - create score variables
step4: data checks and proc contents
```

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

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

- **E2120P2P** - main program that has all the parameters supplied by a user (see below for parameter and variable list). It calls main macro **E2120P2M**
- **E2120P2M** - main macro that creates HCC and SCORE variables by calling other external macros
- **AGESEXV2** - create age/sex, originally disabled, disabled variables
- **V2110ED3** - performs edits to ICD10 code. Medicare Code Editor (MCE) is source of edits.
- **V20H87L1** - assigns labels to HCCs
- **V20H87H1** - sets HCC=0 according to hierarchies
- **SCOREVAR** - calculates a score variable
- **F2120H1R.TXT** - a txt version of the format that has a cross-walk from ICD10 codes to V21 CC categories (use for reference only). This format contains ICD10 codes valid in FY2019/FY2020.
- **F2120H1R** - format library containing all the formats for the software.
- **D2117P6R** - relative coefficients for 5 regression models created on CY2014/2015 data using the denominators 80,612.96 for dialysis and transplant and 9,366.89 for functioning graft (sent by CMS on 9/26/2018, and 10/12/2017 respectively). These were based on the Specialty Code diagnoses filtering method and contain actuarially-adjusted coefficients for: the New Enrollee Dialysis model, the Institutional Enrollee Functioning Graft model and the New Enrollee Functioning Graft model.

Format library and coefficients file are SAS transport files, which may be used on any platform running SAS. The user should use the following program to convert them to SAS format files.

Code for converting coefficients transport file to SAS file:

```
filename inc "C:\user defined location of the transport file\D2117P6R";
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\F2120H1R";
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 or 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

- **MCAID**  
-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** - variable name for Beneficiary ID (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 ICD10 diagnoses  
1=YES, 0=NO
- **DATE\_ASOF** - reference date to calculate age. Set to February 1 of the payment year for consistency with CMS.
- **DF\_DG** - normalization factor set by CMS used to multiply dialysis and transplant scores (currently set to 1 by default)
- **DF\_POSTG** - normalization factor set by CMS used to multiply functioning graft scores (currently set to 1 by default)

### **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, **E2120P2P**, in the **KEEPVAR** parameter of Macro **E2120P2M** 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) HCCs defined in the main program **E2120P2P** by the macro variable **&HCCV21\_list87**
- 4) CCs (condition categories assigned before hierarchies are applied) defined in the main program **E2120P2P** by the macro variable **&CCV21\_list87**
- 5) Score variables:

- **SCORE\_DIAL** - dialysis for continuing enrollees
- **SCORE\_DIAL\_NE** - dialysis for new enrollees

Kidney transplant scores

- **SCORE\_TRANS\_KIDNEY\_ONLY\_1M** - first month
- **SCORE\_TRANS\_KIDNEY\_ONLY\_2M** - second month
- **SCORE\_TRANS\_KIDNEY\_ONLY\_3M** - third month

4-9 months duration of functioning graft scores

- **SCORE\_GRAFT\_COMM\_DUR4\_9\_GE65** - community aged for Functioning Graft
- **SCORE\_GRAFT\_COMM\_DUR4\_9\_LT65** - community non-aged for Functioning Graft
- **SCORE\_GRAFT\_INST\_DUR4\_9\_GE65** - institutional aged for Functioning Graft
- **SCORE\_GRAFT\_INST\_DUR4\_9\_LT65** - institutional non-aged for Functioning Graft
- **SCORE\_GRAFT\_NE\_DUR4\_9\_GE65** - new enrollee aged for Functioning Graft
- **SCORE\_GRAFT\_NE\_DUR4\_9\_LT65** - new enrollee non-aged for Functioning Graft

10 or more months duration of functioning graft scores

- **SCORE\_GRAFT\_COMM\_DUR10PL\_GE65** - community aged for Functioning Graft
- **SCORE\_GRAFT\_COMM\_DUR10PL\_LT65** - community non-aged for Functioning Graft
- **SCORE\_GRAFT\_INST\_DUR10PL\_GE65** - institutional aged for Functioning Graft
- **SCORE\_GRAFT\_INST\_DUR10PL\_LT65** - institutional non-aged for Functioning Graft
- **SCORE\_GRAFT\_NE\_DUR10PL\_GE65** - new enrollee aged for Functioning Graft
- **SCORE\_GRAFT\_NE\_DUR10PL\_LT65** - new enrollee non-aged for Functioning Graft

6) Normalization factors:

- **DF\_DG** - normalization factor set by CMS, used to multiply dialysis and transplant scores (currently set to 1 by default)
- **DF\_POSTG** - normalization factor set by CMS, used to multiply functioning graft scores (currently set to 1 by default)

If a beneficiary receives a kidney transplant, the plan is paid using the transplant model for the month of the transplant and the two subsequent months, regardless of whether the beneficiary returns to dialysis status during that time period. The transplant model uses the Medicare costs for these months to assign a factor to each of the months.

- Month 1 - payment for transplant stay
- Months 2 and 3 - payment for first two months after stay

After Month 3 a person receives a Functioning Graft score based on the non-ESRD model for the person plus an add-on factor for post-graft status that depends on the age of a beneficiary and duration of the graft.

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