HHS RISK ADJUSTMENT MODEL ALGORITHM INSTRUCTIONS

Contents

Overview

Section 1343 of the Affordable Care Act provides for a permanent risk adjustment program. To protect against potential effects of adverse selection, the risk adjustment program transfers funds from plans with relatively lower-risk enrollees to plans with relatively higher-risk enrollees. It generally applies to non-grandfathered individual and small group plans inside and outside Exchanges.

The HHS risk adjustment methodology was proposed and described in the draft notice of benefit and payment parameters for 2014 (CMS-9964-P), which was published on December 7, 2012 at http://www.gpo.gov/fdsys/pkg/FR-2012-12-07/pdf/2012-29184.pdf. The comment period closes December 31, 2012

The methodology that HHS proposes to use when operating a risk adjustment program on behalf of a State would calculate a plan average risk score for each covered plan based upon the relative risk of the plan's enrollees, and apply a payment transfer formula in order to determine risk adjustment payments and charges between plans within a risk pool within a market within a State. The proposed risk adjustment methodology addresses three considerations: (1) the newly insured population; (2) plan metal level differences and permissible rating variation; and (3) the need for risk adjustment transfers that net to zero. The proposed risk adjustment methodology developed by HHS:

- Is developed on commercial claims data for a population similar to the expected population to be risk adjusted;
- Employs the hierarchical condition category ("HCC") grouping logic used in the Medicare risk adjustment program, with HCCs refined and selected to reflect the expected risk adjustment population;
- Establishes concurrent risk adjustment models, one for each combination of metal level (platinum, gold, silver, bronze, catastrophic) and age group (adult, child, infant);
- Results in payment transfers that net to zero within a risk pool within a market within a State;

Note: Definitions taken directly from the Healthcare Common Procedure Coding System (HCPCS) code set and the Current Procedural Terminology (CPT) codes.

- Adjusts payment transfers for plan metal level, geographic rating area, induced demand, and age rating, so that transfers reflect health risk and not other cost differences; and
- Transfers funds between plans within a risk pool within a market within a State.

As a response to external comments for technical details on the proposed HHS risk adjustment methodology, this document provides draft HHS risk adjustment models instructions for benefit year 2014. The risk adjustment methodology, as proposed, consists of concurrent risk adjustment models, one for each combination of metal level (platinum, gold, silver, bronze, and catastrophic) and age group (adult, child, infant). This document provides the detailed information needed to calculate risk scores given individual diagnoses.

The draft model instructions are based on the methodology described in the proposed notice of benefit and payment parameters. Please direct questions regarding the model instructions to HHS HCC Risk Adjustment Models at hhshccraops@cms.hhs.gov. This mailbox will be used only to answer questions pertaining to operations of the HHS risk adjustment model as posted to this site. We look forward to assisting with inquiries pertaining to your risk adjustment program operations using the proposed HHS-HCC risk adjustment models.

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I.   Introduction
The risk adjustment program transfers funds from lower than average risk plans to higher than average risk plans using a specified methodology. A risk adjustment methodology includes a risk adjustment model, a determination of plan average actuarial risk, and a calculation of payments and charges.[1] The latter two elements are referred to by HHS as the payment transfer formula. This document provides a detailed description of the proposed HHS risk adjustment models, and enables interested parties to develop software to determine risk scores given individual diagnoses.

This document should be viewed as a supplement to the draft HHS notice of benefit and payment parameters, which was published in the Federal Register on December 7, 2012, and can be found at http://www.gpo.gov/fdsys/pkg/FR-2012-12-07/pdf/2012-29184.pdf. Please note that the

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1 A risk adjustment methodology also includes a data collection approach and a schedule for program operation. These elements are not discussed in this document.

Note: Definitions taken directly from the Healthcare Common Procedure Coding System (HCPCS) code set and the Current Procedural Terminology (CPT) codes.

models described herein are proposed and will be finalized in the HHS notice of benefit and payment parameters. The comment period closes December 31, 2012.

The following is a description of the proposed HHS risk adjustment models. This description includes a narrative and accompanying tables for calculating the risk scores from diagnoses in the proposed HHS risk adjustment models. The proposed HHS risk adjustment models calculate risk scores by summing an enrollee's factors (age/sex, HCCs, and interaction terms). This description shows, in detail, how individual diagnoses are assigned to HCCs, and then allows the user to build individual risk scores from those diagnoses.

The intent is to outline the steps needed to produce the risk scores from the HHS risk adjustment models.

The proposed HHS risk adjustment methodology includes risk adjustment models based on age, as detailed in Table 1 Model Membership. Adult scores are calculated for enrollees age 21+ using the adult models set. Child scores are calculated for enrollees age 2 – 20 using the child model set. Infant scores are calculated for enrollees age 0 – 1 using the infant model set. Because HHS proposes to predict plan liability, there are 5 models within each age group model set – one each for platinum, gold, silver, bronze, and catastrophic plans.

Listed below are five sections that describe the algorithm for creating risk scores. Any algorithm developed to calculate risk scores should prepare the diagnosis-level file and use it to assign HCCs for each person. This is described in Section II and includes the list of acceptable CPT/HCPCS codes and is listed in Table 2. Section III and Section III, respectively, identify that data that are inputted into and outputted from the proposed Risk adjustment model. Finally Section V describes the algorithm to produce risk scores (i.e., outputs). First, the algorithm should crosswalk acceptable diagnoses to HHS Condition Categories (CCs). Then the algorithm should create HHS Hierarchical Condition Categories (HCCs) by imposing hierarchies on the HHS-CCs. For persons without claims, zeros are assigned to all HHS-CCs and HHS-HCCs. After HHS-HCCs are created, the algorithm should compute predicted scores using the factors from the adult, child and infant HHS risk adjustment regression models. This information is referenced in Tables 3-9.

The factors from the following regression models are used to produce risk scores:
- Adult regressions
  - Adult platinum
  - Adult gold
  - Adult silver
  - Adult bronze
  - Adult catastrophic
- Child regressions
  - Child platinum
  - Child gold
  - Child silver
  - Child bronze
  - Child catastrophic
- Infant regressions
  - Infant platinum

Note: Definitions taken directly from the Healthcare Common Procedure Coding System (HCPCS) code set and the Current Procedural Terminology (CPT) codes.

- o Infant gold
- o Infant silver
- o Infant bronze
- o Infant catastrophic

Terminology: In this document, the abbreviations HHS-HCC and HCC are used interchangeably for Health and Human Services Hierarchical Condition Categories. The abbreviations HHS-CC and CC are used interchangeably for HHS Condition Categories.

II. Creation of diagnosis-level file according to source of diagnoses allowable for risk adjustment

The diagnosis-level input file (Part III) should include ICD-9 CM diagnosis codes used for risk adjustment. These ICD-9 CM diagnosis codes are listed in Table 3 ICD-9 to HHS-Condition Category (CC) Crosswalk. Each record (claim, encounter) is evaluated using an algorithm on whether or not the record's diagnoses are included in the diagnoses file to be inputted into the algorithm or software. This section on diagnoses file preparation explains the algorithm on how each record is evaluated on whether or not to include the record's diagnoses in CC/HCC creation.

The diagnosis-level input file should only include ICD-9 CM diagnosis codes from Table 3 that are from sources allowable for risk adjustment. The steps below provide logic to determine which diagnoses are allowable. Note that Steps 1 and 3 reference the Table 2 CPT/HCPCS Included List, which provides the 2013 CPT/HCPCS codes used to define service types that are acceptable sources of diagnoses for risk adjustment. The CPT/HCPCS codes marking services with diagnoses allowable for risk adjustment are listed in column A of Table 2. Columns B and C list the long description and short description of the procedure codes, respectively. Column D identifies applicable footnotes on the CPT/HCPCS codes. Notes begin on row 6966 of the Excel table with the line "Notes:" and should not be imported by any program.

1. Professional source of diagnosis
   a. For professional records, use diagnoses from line items with at least one acceptable CPT/HCPCS code (Table 2). If there is at least one acceptable line on the record, use all the header diagnoses.
   b. If there are no acceptable service lines on the claim, do not use any of the diagnoses for risk adjustment.
2. Inpatient facility source of diagnosis
   a. Use all header diagnoses from records where facility bill type code equals one of the following:
      i. 110 (inpatient nonpayment/zero claim); or
      ii. 111 (inpatient admit through discharge); or
      iii. 114 (inpatient interim- last claim); or
      iv. 116 (inpatient adjustment of prior claim); or
      v. 117 (inpatient replacement of prior claim).
   b. If the facility bill type code =114, then also use all header diagnoses on related records with facility bill type code = 112 (inpatient interim-first claim) or 113 (inpatient interim-continuing claim).

Note: Definitions taken directly from the Healthcare Common Procedure Coding System (HCPCS) code set and the Current Procedural Terminology (CPT) codes.

      c. If the facility bill type code =117 and is being used as a 114 or final interim bill, then also use all header diagnoses on related records with facility bill type code = 117 and discharge status code 30.

      d. There is no procedure screen for these record types.

   3. Outpatient facility source of diagnosis

      a. Restrict records to those with facility bill type code equal to:

         i. 130 (hospital outpatient nonpayment/zero claim); or

         ii. 131 (hospital outpatient admit though discharge); or

         iii. 132 (hospital outpatient interim- first claim); or

         iv. 133 (hospital outpatient interim- continuing claim); or

         v. 134 (hospital outpatient interim-last claim); or

         vi. 136 (hospital outpatient adjustment of prior claim); or

         vii. 137 (hospital outpatient replacement of prior claim); or

         viii. 71x (rural health clinic); or

         ix. 73x (federally qualified health center); or

         x. 76x (community mental health center).

      b. For claims with at least one acceptable CPT/HCPCS code (Table 2) in the revenue center trailers, use all header diagnoses. Otherwise, do not use the diagnoses for risk adjustment.

Note on bundled claims for mother and newborn infant: In practice, some hospital claims for childbirth include both the mother's record and the newborn infant's record on the same claim (diagnoses and procedure codes). Because there are separate adult, child, and infant risk adjustment models and some of the diagnosis codes may not be distinguishable between mother and infant on these bundled claims, enrollees with bundled claims are excluded within the algorithm as is detailed in Table 1, Rows 11-29. Note that the bundled claims should be redefined as two separate claims (mother and infant) in order to be appropriately included in the input data files and used for appropriately calculating risk scores. Related to this issue, age 0 infants lacking a maturity category are assigned to the newborn "Term" category, as detailed in Table 8, row 129. If a newborn infant's record on a bundled claim were to be redefined as an individual infant claim, he or she would be appropriately assigned to a newborn HHS-HCC.

III.   Input data files for HHS-CC/HCC variable creation

This section describes the two input data files are needed to create HHS-CC and HHS-HCC grouping and regression variables—a person-level file and a diagnoses file.

   1. PERSON file – a person-level file of demographic and enrollment information

      a. ENROLID (or other person identification variable)

         i. character or numeric type and unique to an individual

      b. SEX

         i. one character, 1=male; 2=female

      c. AGE_FIRST

         i. Age in first month of enrollment in benefit year

         ii. Used only for diagnosis-code age edits

      d. AGE_LAST

         i. Age as of last day of enrollment in benefit year

Note: Definitions taken directly from the Healthcare Common Procedure Coding System (HCPCS) code set and the Current Procedural Terminology (CPT) codes.

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   ii. Used for all risk adjustment purposes other than diagnosis-code age edits
  e. METAL
   i. Enrollee's metal level.
   ii. Allowable values: platinum, gold, silver, bronze, catastrophic.
  f. CSR_INDICATOR
   i. Person-level indicator. Enrollees who qualify for cost-sharing reductions will be assigned CSR_INDICATOR =1-8. Non-CSR recipients will be assigned CSR_INDICATOR = 0.
    1. 1 = Enrollees in 94% AV Silver Plan Variation
    2. 2 = Enrollees in 87% AV Silver Plan Variation
    3. 3 = Enrollees in 73% AV Silver Plan Variation
    4. 4 = Enrollee in Zero Cost Sharing Plan Variation of Platinum Level QHP
    5. 5 = Enrollee in Zero Cost Sharing Plan Variation of Gold Level QHP
    6. 6 = Enrollee in Zero Cost Sharing Plan Variation of Silver Level QHP
    7. 7 = Enrollee in Zero Cost Sharing Plan Variation of Bronze Level QHP
    8. 8 = Enrollee in Limited Cost Sharing Plan Variation
    9. 0 = Non-CSR recipient and enrollees with unknown CSR

 2. DIAG file – a diagnosis-level input file of diagnoses
  a. ENROLID (or other person identification variable that must be the same as in PERSON file)[2]
   i. person identifier of character or numeric type and unique to an individual
  b. DIAG
   i. ICD-9-CM diagnosis code, 5 character field, no periods, left justified. Codes should be to the greatest level of available specificity. (Age and sex edits for diagnoses are applied in Part V, step 1(2a) to ensure diagnoses are appropriate for the age and sex of the enrollee.) Only diagnoses from allowable sources (Part II) should be included in the diagnosis-level file.

IV. Variables output by the algorithm

This section describes the variables that are outputted by the proposed HHS risk adjustment model. Any software or algorithms developed from the tables output a person-level file and need to be capable of adding any person-level variables that the user wants to keep.

The following variables can be specified:
 1. Any person level variables from the original person level file
 2. Demographic age/sex variables created by the algorithm
 3. HHS-HCCs created by the algorithm
 4. HHS-CCs (condition categories assigned before hierarchies are applied)

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[2] Please note that in operation, this information can not include personally identifiable information.

Note: Definitions taken directly from the Healthcare Common Procedure Coding System (HCPCS) code set and the Current Procedural Terminology (CPT) codes.

5. HHS-HCC groups and HHS-HCC interactions created by the algorithm
6. Infant model maturity categories, severity level categories, and maturity by severity level interactions created by the algorithm
7. Score variables:
    a. Adult Models
        i. SCORE_ADULT_PLATINUM
        ii. SCORE_ADULT_GOLD
        iii. SCORE_ADULT_SILVER
        iv. SCORE_ADULT_BRONZE
        v. SCORE_ADULT_CATASTROPHIC
    b. Child Models
        i. SCORE_CHILD_PLATINUM
        ii. SCORE_CHILD_GOLD
        iii. SCORE_CHILD_SILVER
        iv. SCORE_CHILD_BRONZE
        v. SCORE_CHILD_CATASTROPHIC
    c. Infant Models
        i. SCORE_INFANT_PLATINUM
        ii. SCORE_INFANT_GOLD
        iii. SCORE_INFANT_SILVER
        iv. SCORE_INFANT_BRONZE
        v. SCORE_INFANT_CATASTROPHIC
8. CSR adjusted score variables:
    a. Adult Models
        i. CSR_ADJUSTED_SCORE_ADULT_PLATINUM
        ii. CSR_ADJUSTED_SCORE_ADULT_GOLD
        iii. CSR_ADJUSTED_SCORE_ADULT_SILVER
        iv. CSR_ADJUSTED_SCORE_ADULT_BRONZE
        v. CSR_ADJUSTED_SCORE_ADULT_CATASTROPHIC
    b. Child Models
        i. CSR_ADJUSTED_SCORE_CHILD_PLATINUM
        ii. CSR_ADJUSTED_SCORE_CHILD_GOLD
        iii. CSR_ADJUSTED_SCORE_CHILD_SILVER
        iv. CSR_ADJUSTED_SCORE_CHILD_BRONZE
        v. CSR_ADJUSTED_SCORE_CHILD_CATASTROPHIC
    c. Infant Models
        i. CSR_ADJUSTED_SCORE_INFANT_PLATINUM
        ii. CSR_ADJUSTED_SCORE_INFANT_GOLD
        iii. CSR_ADJUSTED_SCORE_INFANT_SILVER
        iv. CSR_ADJUSTED_SCORE_INFANT_BRONZE
        v. CSR_ADJUSTED_SCORE_INFANT_CATASTROPHIC
9. Final unadjusted and CSR-adjusted score variables depending on the enrollee's metal level.
    a. Adult scores
        i. SCORE_ADULT
        ii. CSR_ADJUSTED_SCORE_ADULT

Note: Definitions taken directly from the Healthcare Common Procedure Coding System (HCPCS) code set and the Current Procedural Terminology (CPT) codes.

> b. Child scores
>> i. SCORE_CHILD
>> ii. CSR_ADJUSTED_SCORE_CHILD
> c. Infant scores
>> i. SCORE_INFANT
>> ii. CSR_ADJUSTED_SCORE_INFANT

The user should determine which of the scores is appropriate for the enrollee depending upon the age and plan benefit design of that enrollee.

V. Algorithm to produce output

This section describes the process by which the outputs identified in Section IV are created. The algorithm to produce risk scores can be segmented into five parts—HHS-CC and HHS-HCC creation, model variable creation, access factors table, unadjusted score calculation, and CSR-adjusted score calculation.

Step 1: HHS-CC and HHS-HCC creation. This first step should use Table 3 for HHS-CC creation and Table 4 for HHS-HCC creation.

Table 3 crosswalks ICD-9 codes to the HHS-Condition Categories (CCs) in the risk adjustment models. This table incorporates the ICD-9 Medicare Code Edits (MCEs) for age and sex, the further specified CC age and sex splits, and the creation of CCs and additional CCs.[3] Explanations of the fields in Table 3 are provided below:

- OBS (column A): Observations, numeric count from 1 to 3,518 of the code list.
- ICD9 (column B): Only ICD-9 codes assigned to HCCs in the risk adjustment models are included in this crosswalk. All other ICD-9 codes are assigned to HCCs not included in the risk adjustment models and are not used to calculate risk scores.
- ICD9 Label (column C): Abbreviated ICD-9 code labels.
- Code Valid columns (columns D-F): Identifies the fiscal year in which the ICD-9 codes are valid. There are three possible values in columns D-F:
    - Y = Yes, code is valid ICD-9 code in that fiscal year
    - N = No, code is no longer valid ICD-9 code in that fiscal year
    - (blank) = code is not yet in existence in that fiscal year
- MCE Age Condition [use AGE_FIRST] (column G): Checks that a person with a diagnosis code has the appropriate age for the diagnosis. Conditions listed in this column are required for the CC to be assigned.
    - Newborn diagnosis: Age of 0 years
    - Pediatric diagnosis: Age range is 0-17 years inclusive
    - Maternity diagnosis: Age range is 12-55 years inclusive
    - Adult diagnosis: Age range is 15 years or older

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[3] The diagnosis-code edits used are based on the Definitions of Medicare Code Edits (MCEs), which are updated and published each year to correspond with ICD-9 code updates. The MCEs detect inconsistencies based on a person's age and diagnosis or sex and diagnosis. In addition to the standard MCE age 0 edit list, Table 3 includes these codes as requiring age = 0: V302, V312, V322, V332, V342, V352, V362, V372, and V392. These codes were added because like the other codes in the V30-V39 range which do appear on the MCE age 0 edit list, they correspond to the infant's birth status and should not appear on the mother's record or on an older child's record.

Note: Definitions taken directly from the Healthcare Common Procedure Coding System (HCPCS) code set and the Current Procedural Terminology (CPT) codes.

- MCE Sex Condition (column H): Checks that a person with a diagnosis code has the appropriate sex for the diagnosis. Conditions listed in this column are required for the CC to be assigned.
  - Female indicates the diagnosis is only appropriate for females.
  - Male indicates the diagnosis is only appropriate for males.
- CC Age Split [use AGE_LAST] (column I): Identifies diagnosis codes that are assigned to CCs in the risk adjustment models based on age. ICD-9 codes assigned by age to more than one CC in the risk adjustment models are listed more than once.
- CC Sex Split (column J): Identifies diagnosis codes that are assigned to CCs in the risk adjustment models based on sex. ICD-9 codes assigned by sex to more than one CC in the risk adjustment models are listed more than once.
- CC (column K): Identifies the CC in the risk adjustment models that a person with the ICD-9 code who meets the MCE conditions and CC splits is assigned.
- Additional CC (column L): Identifies the additional CC in the risk adjustment model that a person with the ICD-9 code who meets the MCE conditions and CC Age or Sex splits is assigned. Additional CCs are assigned when the ICD-9 code is assigned to more than one HCC in the risk adjustment models (such as a single ICD-9 diagnosis code that encompasses both chronic kidney disease and heart failure).
- Footnote (column M): Identifies applicable footnotes for the ICD-9 code. Notes begin on row 3523 of the Excel table with the line "Notes:" and should not be imported by any program.

Table 4 provides the hierarchy rules to apply to the CCs to create HHS-HCCs. Explanations of the fields in Table 4 are provided below:
- OBS (column A): Observations, numeric count from 1 to 127 of HCCs in the HHS risk adjustment models.
- HCC (column B): Only HCCs in the risk adjustment models are identified. HCCs are created when hierarchies are applied to CCs.
- Set to 0 HCCs (column C): Hierarchy exclusions for each HCC are listed. Users should set the HCCs in this column to 0 when a person has the HCC listed in column B.
- HCC Label (column D): Full HCC labels.

Use Table 3 and Table 4 to create CCs and HHS-HCCs:
1. Create CC and HHS-HCC 0/1 indicator variable for each HCC in the risk adjustment models listed in Table 4. (Example: CC001, CC002, CC003, CC004, CC006, CC008 ... CC254; HHS_HCC001, HHS_HCC002 ... HHS_HCC254). Initially, set CCs and HHS-HCCs to 0 for each person.
2. If there are any acceptable diagnoses for a person, then:
   a. Perform ICD-9 Medicare Code Edits (MCEs) for age and sex (use MCE Age Condition and MCE Sex Condition columns in Table 3). Use AGE_FIRST for applying MCE age edits. This is done so that age 0 infants who turn age 1 by the end of the year will not have valid age 0 diagnoses excluded that may have been assigned in months earlier in the year in which they were age 0. (Similar issue for ages 17-18.)

     b. If a person meets the MCE conditions, apply CC Age Split and CC Sex Split to create CC (set to 1) using crosswalk of ICD-9 to CCs (use CC Age Split, CC Sex Split, and CC columns in Table 3). Use AGE_LAST for CC age splits.

     c. Create additional CCs (set to 1) using Additional CC column.

3. Create HHS-HCCs after all diagnoses for a person are processed and CC variables are created using hierarchies provided in Table 4.

     a. Set HCC to 1 when corresponding CC is set to 1.

     b. Set the HCCs in column C to 0 when a person has the HCC listed in column B set to 1.

Step 2: Model variable creation.

This step should use Table 5 for demographic variable creation, Table 6 for additional adult model variables, Table 7 for additional child models variables, and Table 8 for additional infant model variables.

Explanations of the fields in Tables 5-8 are provided below:
- Column A identifies the model set in which the variable is used (adult, child or infant).
- Column B identifies the variable name.
- Column C gives a variable description.
- Column D indicates if the variable is used in the model.
- Column E defines the variable creation.

Variables must be assigned values in the same order as defined in Tables 5, 6, 7, and 8. For example, in Table 6, assign a value to variable SEVERE_V3 first, then the HCC group variables, then the severe illness interactions, then the severe illness interaction groups.

Variable creation:

1. Create demographic variables needed for score calculation using Table 5.

     a. A person's age and sex are used to create 1 of 28 mutually exclusive age-sex variables (18 for adult models, 8 for child models, 2 for infant models). Use AGE_LAST.

     b. Because the infant model is computed with females as the reference group for the age-sex demographic variables, there are no separate age-sex demographic variables for females age 0 or 1.

     c. Adult age-sex variables are listed in rows 8-25.

     d. Child age-sex variables are listed in rows 27-34.

     e. Infant age-sex variables are listed in rows 36 and 37.

2. For the adult model, create the severe illness indicator variable.

     a. The severe illness indicator variable, SEVERE_V3, is created when an adult has at least 1 of 8 HHS-HCCs that indicate a severe illness. Rows 5-12 of column E in Table 6 identify these 8 HHS-HCCs.

         i. SEVERE_V3 is initially set to 0 for each adult and is set equal to 1 if the adult has at least 1 of the 8 HHS-HCCs.

3. For the adult and child models – create HCC groups using Tables 6 and 7.

Note: Definitions taken directly from the Healthcare Common Procedure Coding System (HCPCS) code set and the Current Procedural Terminology (CPT) codes.

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a. HCC groups are effectively treated as single HHS-HCCs in the models. The HCC groups are assigned variables GXX, where XX is the group number.
b. For the adult models:
    i. There are 17 adult HCC groups. The group variable names are listed in rows 14-67 of column B of Table 6.
    ii. Initially create the 17 HCC groups for adults and set to 0 for each person.
    iii. The HHS-HCCs in an HCC group are listed in column E of Table 6 starting in row 14.
    iv. A variable for an HCC group is set to equal 1 if an adult has at least one of the HHS-HCCs in a given adult HCC group.
c. For the child models:
    i. There are 17 child HCC groups. The HCC groups are listed in rows 5-59 of column B of Table 7.
    ii. Initially create the 17 HCC groups for children and set to 0 for each person.
    iii. The HHS-HCCs in an HCC group are found in column E of Table 7 starting in row 5.
    iv. A variable for an HCC group is set to equal 1 if a child has at least one of the HHS-HCCs in a given child HCC group.

4. For the adult models – create HHS-HCC interaction variables using Table 6.
b. The variable SEVERE_V3 is used to create the severe illness indicator in HHS-HCC or HCC group interactions. There are 16 interactions identified in rows 71-86 of Table 6.
    i. Interaction variables are initially set to 0 for each adult.
    ii. The variable for an interaction is set to 1 if an adult has SEVERE_V3=1 and the HHS-HCC or HCC group in the interaction =1.
c. The interactions are aggregated to create two severe illness interaction groups based on the predicted expenditures of the interactions that are in the models.
    i. Variables INT_GROUP_H and INT_GROUP_M are set to 0 for each adult.
    ii. INT_GROUP_H is set to 1 if an adult has at least 1 of the 9 high-cost interactions. The variable and interactions are found in rows 88-96 of Table 6.
    iii. INT_GROUP_M is set to 1 if an adult has at least 1 of the 7 medium-cost interactions and INT_GROUP_H is set to 0. The variable and interactions are found in rows 98-104 of Table 6.

5. For the infant models – create maturity and severity categories and maturity by severity level interaction variables using Table 8.
a. Table notation: Severity category and maturity category variables (which are not included in the regression, but are used to create regression interaction variables) use the "IHCC_" prefix designating them as Infant variables. Examples: IHHC_Severity5; IHCC_Extremely_Immature.

Note: Definitions taken directly from the Healthcare Common Procedure Coding System (HCPCS) code set and the Current Procedural Terminology (CPT) codes.

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b. Create 5 severity level category 0/1 indicator variables based on HHS-HCC flags (See Table 8, rows 5-116). Set to 1 if any of the corresponding HHS-HCC variables is set to 1.
   a. Severity Level 5 (Highest)
   b. Severity Level 4
   c. Severity Level 3
   d. Severity Level 2
   e. Severity Level 1 (Lowest)
c. Apply hierarchies so that each age 0 or age 1infant has only a single severity level variable, the highest qualifying level, set to 1. (See Table 8, rows 118-122.) Note that infants lacking any of the HHS-HCCs corresponding to severity levels are assigned to Severity Level 1 (Lowest).
d. Create 5 maturity category 0/1 indicator variables set to 1 based on age only if age 1 and on age as well as newborn HHS-HCC flags if age 0. (See Table 8, rows 124-129).
   a. Age 1
   b. Extremely Immature
   c. Immature
   d. Premature/Multiples
   e. Term
e. Apply hierarchies so that that each age 0 or age 1 infant has only a single maturity variable set to 1. (See Table 8, rows 130-132). Note that age 0 infants lacking a newborn HHS-HCC (242-249) are assigned to Term.
f. Create 25 maturity by severity level interactions (0/1) using the 5 maturity category variables and 5 severity level category variables. These are mutually-exclusive interactions—each infant will have only one maturity by severity level interaction set to 1.
   a. Extremely_Immature_x_Severity5
   b. Extremely_Immature_x_Severity4
   c. Extremely_Immature_x_Severity3
   d. Extremely_Immature_x_Severity2
   e. Extremely_Immature_x_Severity1
   f. Immature_x_Severity5
   g. Immature_x_Severity4
   h. Immature_x_Severity3
   i. Immature_x_Severity2
   j. Immature_x_Severity1
   k. Premature_Multiples_x_Severity5
   l. Premature_Multiples_x_Severity4
   m. Premature_Multiples_x_Severity3
   n. Premature_Multiples_x_Severity2
   o. Premature_Multiples_x_Severity1
   p. Term_x_Severity5
   q. Term_x_Severity4
   r. Term_x_Severity3
   s. Term_x_Severity2

Note: Definitions taken directly from the Healthcare Common Procedure Coding System (HCPCS) code set and the Current Procedural Terminology (CPT) codes.

t. Term_x_Severity1
u. Age1_x_Severity5
v. Age1_x_Severity4
w. Age1_x_Severity3
x. Age1_x_Severity2
y. Age1_x_Severity1

Step 3: Access factors in Table 9.
1. For the adult models, use adult factors in rows 4-167 for each of the metal levels (columns D-H).
2. For the child models, use child factors in rows 169-320 for each of the metal levels (columns D-H).
3. For the infant models, use infant factors in rows 322-348 for each of the metal levels (columns D-H).

Step 4: Unadjusted score calculation (using directions in Tables 6-8, variables created in Tables 5-8, and factors from Table 9).

1. For each adult, create an adult model score for the metal level in which that adult is enrolled (corresponding to scores in Part IV).
   a. Create scores for each metal level using directions in rows 106-111 in Table 6.
      i. SCORE_ADULT_PLATINUM
      ii. SCORE_ADULT_GOLD
      iii. SCORE_ADULT_SILVER
      iv. SCORE_ADULT_BRONZE
      v. SCORE_ADULT_CATASTROPHIC
   b. The score for each of the above variables is the sum of the factors of the corresponding metal level in Table 9 for all variables set to 1 for that adult: demographic variable, any HHS-HCCs, any HCC groups, and a severe illness interaction group if applicable.
      i. SCORE_ADULT_PLATINUM uses factors from column D
      ii. SCORE_ADULT_GOLD uses factors from column E
      iii. SCORE_ADULT_SILVER uses factors from column F
      iv. SCORE_ADULT_BRONZE uses factors from column G
      v. SCORE_ADULT_CATASTROPHIC uses factors from column H
   c. Identify the metal level in which the adult is enrolled (Table 1).
   d. Create an adult model score SCORE_ADULT for the metal level in which the adult is enrolled using directions in rows 130-131 in Table 6.
2. For each child create a child model score for the metal level in which that child is enrolled (corresponding to scores in Part IV).
   a. Create scores for each metal level using directions in rows 63-67 in Table 7.
      i. SCORE_CHILD_PLATINUM
      ii. SCORE_CHILD_GOLD
      iii. SCORE_CHILD_SILVER
      iv. SCORE_CHILD_BRONZE
      v. SCORE_CHILD_CATASTROPHIC

Note: Definitions taken directly from the Healthcare Common Procedure Coding System (HCPCS) code set and the Current Procedural Terminology (CPT) codes.

b. The score for each of the above variables is the sum of the factors of the corresponding metal level in Table 9 for all variables set to 1 for that child: demographic variable, any HHS-HCCs, and any HCC groups.
    i. SCORE_CHILD_PLATINUM uses factors from column D
    ii. SCORE_CHILD_GOLD uses factors from column E
    iii. SCORE_CHILD_SILVER uses factors from column F
    iv. SCORE_CHILD_BRONZE uses factors from column G
    v. SCORE_CHILD_CATASTROPHIC uses factors from column H
c. Identify the metal level in which the child is enrolled (Table 1).
d. Create a child model score SCORE_CHILD for the metal level in which the child is enrolled using directions in rows 86-87 in Table 7.

3. For each infant create an infant model score for the metal level in which that infant is enrolled (corresponding to scores in Part IV) using directions starting at row 160 of Table 8, infant variables created in Tables 5 and 8, and factors from Table 9.
  a. Unadjusted infant risk score is the sum of (0/1 variable x factor) over all of the following:
    i. 0/1 age-sex categories for INFANT models
    ii. 0/1 maturity x severity level interactions for INFANT models
  b. The unadjusted score is the sum of the factors of the corresponding metal level in Table 9 for all variables set to 1 for that infant.
    i. SCORE_INFANT_PLATINUM uses factors from column D
    ii. SCORE_INFANT_GOLD uses factors from column E
    iii. SCORE_INFANT_SILVER uses factors from column F
    iv. SCORE_INFANT_BRONZE uses factors from column G
    v. SCORE_INFANT_CATASTROPHIC uses factors from column H
  c. In effect, females will have a single maturity level x severity level interaction set to 1 and that factor will be their score. Males will a have a single maturity level x severity level interaction set to 1 and a single age-sex variable set to 1; the sum of the factors for those two variables will be their score.
  d. Identify the metal level in which the infant is enrolled (Table 1).
  e. Create an infant model score SCORE_INFANT for the metal level in which the infant is enrolled using directions in rows183-184 in Table 8.

Step 5: CSR-adjusted score calculation (using instructions in Tables 6-8).

1. For each adult, create an adult model CSR-adjusted score for the metal level in which that adult is enrolled (corresponding to CSR-adjusted scores in Part IV).
  a. Each adult will have one of the following CSR-adjusted risk scores that corresponds to his/her metal level. CSR-adjusted scores are created using directions in rows 113-128 in Table 6.
    i. CSR_ADJUSTED_SCORE_ADULT_PLATINUM
    ii. CSR_ADJUSTED_SCORE_ADULT_GOLD
    iii. CSR_ADJUSTED_SCORE_ADULT_SILVER
    iv. CSR_ADJUSTED_SCORE_ADULT_BRONZE
    v. CSR_ADJUSTED_SCORE_ADULT_CATASTROPHIC
  b. Identify the metal level in which the adult is enrolled (Table 1).

Note: Definitions taken directly from the Healthcare Common Procedure Coding System (HCPCS) code set and the Current Procedural Terminology (CPT) codes.

c. Create an adult model score CSR_ADJUSTED_SCORE_ADULT for the metal level in which the adult is enrolled using directions in rows 133-135 in Table 6.
2. For each child, create a child model CSR-adjusted score for the metal level in which that child is enrolled (corresponding to CSR-adjusted scores in Part IV).
   a. Each child will have one of the following CSR-adjusted risk scores that corresponds to his/her metal level. CSR-adjusted scores are created using directions in rows 69-84 in Table 7.
      i. CSR_ADJUSTED_SCORE_CHILD_PLATINUM
      ii. CSR_ADJUSTED_SCORE_CHILD_GOLD
      iii. CSR_ADJUSTED_SCORE_CHILD_SILVER
      iv. CSR_ADJUSTED_SCORE_CHILD_BRONZE
      v. CSR_ADJUSTED_SCORE_CHILD_CATASTROPHIC
   b. Identify the metal level in which the child is enrolled (Table 1).
   c. Create a child model score CSR_ADJUSTED_SCORE_CHILD for the metal level in which the child is enrolled using directions in rows 89-91 in Table 7.
3. For each infant, create an infant model CSR-adjusted score for the metal level in which that infant is enrolled (corresponding to CSR-adjusted scores in Part IV).
   a. Each infant will have one of the following CSR-adjusted risk scores that corresponds to his/her metal level. CSR-adjusted scores are created using directions in rows 166-181 in Table 8.
      i. CSR_ADJUSTED_SCORE_INFANT_PLATINUM
      ii. CSR_ADJUSTED_SCORE_INFANT_GOLD
      iii. CSR_ADJUSTED_SCORE_INFANT_SILVER
      iv. CSR_ADJUSTED_SCORE_INFANT_BRONZE
      v. CSR_ADJUSTED_SCORE_INFANT_CATASTROPHIC
   b. Identify the metal level in which the infant is enrolled (Table 1).
   c. Create an infant model score CSR_ADJUSTED_SCORE_INFANT for the metal level in which the infant is enrolled using directions in rows186-188 in Table 8.