ORACL: An Algorithm to Predict Out-of-Hospital Death Using Insurance Claims Data

Written By: Jessica C Young

# Code documentation

**Input Dataset**

The input dataset should be a patient-level dataset with the date of disenrollment, and indicators for each predictor in the algorithm. Required variables are summarized in the table below.

|  |  |  |
| --- | --- | --- |
| **Variable Name** | **Description** | **Values** |
| ID | Beneficiary ID | integer |
| DISENROLLDATE | Date of disenrollment from database | numerical date |
| AGE\_18\_34 | 1 = Age is between 18 and 34 | 1 or 0 |
| AGE\_35\_44 | 1 = Age is between 35 and 44 | 1 or 0 |
| AGE\_45\_54 | 1 = Age is between 45 and 54 | 1 or 0 |
| AGE\_55\_64 | 1 = Age is between 55 and 64 | 1 or 0 |
| AGE\_65\_74 | 1 = Age is between 65 and 74 | 1 or 0 |
| AGE\_75\_84 | 1 = Age is between 75 and 84 | 1 or 0 |
| AGE\_85PLUS | 1 = Age is greater than or equal to 85 | 1 or 0 |
| DISENR\_MON1 | 1 = Date of disenrollment in January | 1 or 0 |
| DISENR\_MON2 | 1 = Date of disenrollment in February | 1 or 0 |
| DISENR\_MON3 | 1 = Date of disenrollment in March | 1 or 0 |
| DISENR\_MON4 | 1 = Date of disenrollment in April | 1 or 0 |
| DISENR\_MON5 | 1 = Date of disenrollment in May | 1 or 0 |
| DISENR\_MON6 | 1 = Date of disenrollment in June | 1 or 0 |
| DISENR\_MON7 | 1 = Date of disenrollment in July | 1 or 0 |
| DISENR\_MON8 | 1 = Date of disenrollment in August | 1 or 0 |
| DISENR\_MON9 | 1 = Date of disenrollment in September | 1 or 0 |
| DISENR\_MON10 | 1 = Date of disenrollment in October | 1 or 0 |
| DISENR\_MON11 | 1 = Date of disenrollment in November | 1 or 0 |
| DISENR\_MON12 | 1 = Date of disenrollment in December | 1 or 0 |
| FEMALE | 1 = Female | 1 or 0 |
| 0 = Male | 1 or 0 |
| MEDICARE | 1 = Patient record is from Medicare and age <65 | 1 or 0 |
| REGION1 | 1 = Patient resides in the Northeast US Region | 1 or 0 |
| REGION2 | 1 = Patient resides in the North Central US Region | 1 or 0 |
| REGION3 | 1 = Patient resides in the South US Region | 1 or 0 |
| REGION4 | 1 = Patient resides in the West US Region | 1 or 0 |
| REGION5 | 1 = Patient resides in Unknown US Region | 1 or 0 |
| fER | 1 = Evidence of claims with Service category (SVCSCAT ending in 20) indicating ER within 365 days of disenrollment | 1 or 0 |
| fHOSPICE | 1 = Evidence of claims with Service category SVCSCAT ending in 42 or standard provider = 38) indicating Hospice within 365 days of disenrollment | 1 or 0 |
| fIP | 1 = Evidence of Inpatient admission within 365 days of disenrollment | 1 or 0 |
| fCCI1 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI2 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI3 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI4 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI5 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI6 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI7 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI8 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI9 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI10 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI11 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI12 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI13 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI14 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI15 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI16 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI17 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fCCI18 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX1 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX2 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX3 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX4 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX5 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX6 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX7 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX8 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX9 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX10 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX11 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX12 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX13 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX14 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX15 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX16 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX17 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX18 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX19 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX20 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX21 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX22 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX23 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX24 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX25 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX26 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX27 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX28 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX29 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX30 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| fELIX31 | 1 = at least one Inpatient or Outpatient dx claim in the 365 days prior to disenrollment | 1 or 0 |
| ELIX\_SCORE | ELIX\_SCORE=( 7\*fELIX1 + 5\*fELIX2  - fELIX3 + 4\*fELIX4 +       2\*fELIX5 + 7\*fELIX8 + 6\*fELIX9 + 3\*fELIX10 + 5\*fELIX14 + 11\*fELIX15 + 9\*fELIX18 + 12\*fELIX19 + 4\*fELIX20 + 3\*fELIX22 - 4\*fELIX23 + 6\*fELIX24 + 5\* fELIX25 - 2\*fELIX26 - 2\*fELIX27 -      7\*fELIX29 - 3\*fELIX31) | integer |
|  |
| OBAMACARE | 1 = dependent, 25 years of age at time of disenrollment, disenrollment occurring in 2010 or later | 1 or 0 |  |
| ICDVER\_10 | 1 = disenrollment occurring on or after October 10, 2015 | 1 or 0 |  |

**Code**

This code assigns the predicted probability of death at the time of disenrollment, using algorithm A (developed using data from 2007-2018) and algorithm B (developed using data from 2007-2011).

Two variables are added to the original dataset:

* PredDeath18: predicted probability of death @ disenrollment using algorithm A
* PredDeath11: predicted probability of death @ disenrollment using algorithm B

**Resources**

* Sample input dataset
* Code lists for CCI
  + ICD-9: https://www.hcup-us.ahrq.gov/toolssoftware/chronic/chronic.jsp
  + ICD-10: https://www.hcup-us.ahrq.gov/toolssoftware/chronic\_icd10/chronic\_icd10.jsp
* Code lists for Elixhauser components
  + ICD-9: https://www.hcup-us.ahrq.gov/toolssoftware/comorbidity/comorbidity.jsp
  + ICD-10: https://www.hcup-us.ahrq.gov/toolssoftware/comorbidityicd10/comorbidity\_icd10.jsp
* Datasets with coefficients for both models
* Code applying algorithm