Risk Adjustment in R

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Agenda

- Introduction
  - What is risk adjustment?
  - Toy calculation
- Motivation
  - Why migrate to R?
- Calculation
  - Methodology
  - Large-scale computation results
- Next Steps & References

What is Risk Adjustment?

▶ Risk adjustment allows CMS to pay plans for the risk of the beneficiaries they enroll, instead of an average amount for Medicare beneficiaries.

    ▶ By risk adjusting plan payments, CMS is able to make appropriate and accurate payments for enrollees with differences in expected costs.

    ▶ Risk adjustment is used to adjust bidding and payment based on the health status and demographic characteristics of an enrollee.

    ▶ Risk scores measure individual beneficiaries' relative risk and risk scores are used to adjust payments for each beneficiary's expected expenditures.

    ▶ By risk adjusting plan bids, CMS is able to use standardized bids as base payments to plans.

▶ CMS provides a SAS software program for each of the CMS-HCC risk adjustment models that allows organizations to verify and predict risk scores. Users must have a SAS license to use the SAS program.

Toy Calculation

- An 83 year old man who originally became entitled to Medicare as disabled is diagnosed with pneumococcal pneumonia (ICD-9 code 481, HCC112).

  - Originally insured due to disability, OREC = 1

  - Originally disabled, male = 0.168

  - Pneumococcal Pneumonia, Emphysema, Lung Abscess, HCC112 = 0.249

 - Risk Score = (demographics) + 0.168+0.249

Why Migrate to R?

- Offer open source access to risk adjustment models in R versus only a SAS implementation

- Provide a **unified** framework for all diagnosis-based risk adjustment models

- Be lightning fast! (<=O(N) time in number of members)

- More elegant code than disparate SAS macros for different risk adjusters

Calculation Methodology

risk_factors <- cmshcc::icd9RiskAdjCMSHCC(DIAG, PERSON, cmshcc_list)

1. Demographics scoring
   - Uses the cut function to break ages into age bands
2. Diagnosis to Condition Category Mapping
   - Uses a call to icd9Comorbid and Rcpp from the icd9 package to map individual diagnoses to diagnosis categories
3. Condition Category Hierarchies (Prevent double-counting)
   - Applies hierarchies through logical operations on column vectors
4. Interactions (Add "bonus" scoring for co-morbidities)
   - Applies interaction terms through logical operations on column vectors

Large-Scale Calculation Using cmshcc
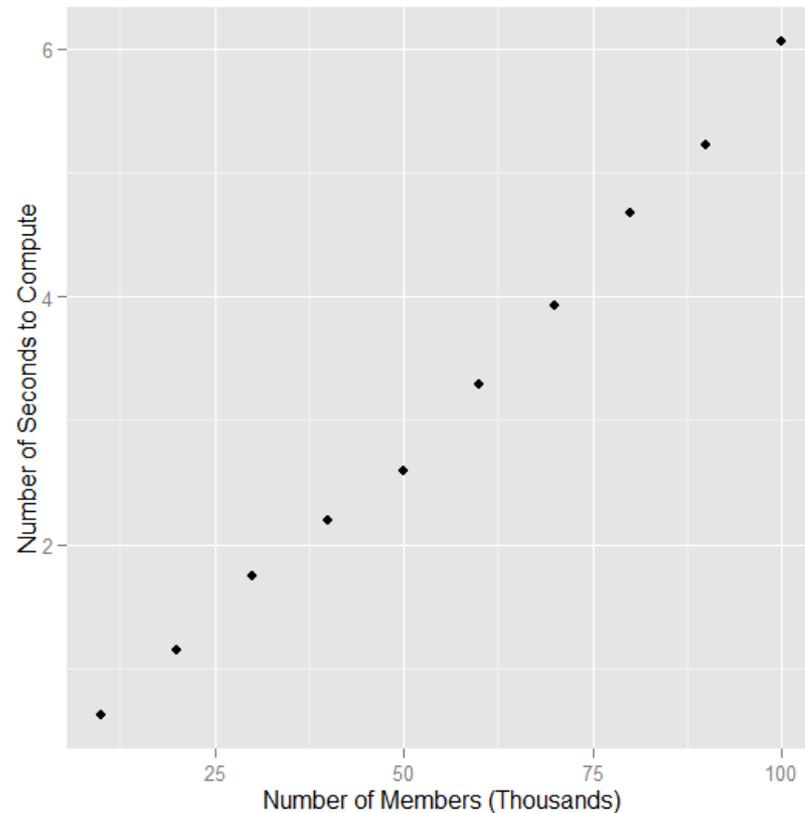
Laptop Specifications:

▶ one core 1.70 GHz processor

▶ 6.00 GB RAM

▶ 64-bit Windows 8 Operating system

Next Steps

- Expand to other risk adjustment systems
  - Dutch risk adjustment?
- Extend to ICD-10 diagnosis set by 10/1/2015
- Incorporate machine learning to automatically generate optimal risk adjustment models

Download and give feedback at:

- devtools::install_github("healthactuary/cmshcc")

References

- Risk Adjustment Rules - http://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/Downloads/mc86c07.pdf

- Risk Adjustment Factor Values - http://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/downloads/Advance2014.pdf

- Risk Adjustment SAS code - http://www.cms.gov/Medicare/Health-Plans/MedicareAdvtgSpecRateStats/Risk-Adjustors.html