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MEDICAL, SOCIAL, AND OTHER DETERMINANTS OF HEALTH CARE COSTS IN MASSHEALTH

Arlene S. Ash
Dept. of Quantitative Health Sciences
UMCCTS 6th Annual Research Retreat
May 20, 2016
A Collaborative Work-In-Progress

- Conflict of interest
  - This work is funded by the State and builds upon the DxCG risk scores that MassHealth licenses from Verisk Health, Inc. I was a co-developer of the DxCG models and currently consult for Verisk

- Many people have contributed to the current project
  - MassHealth and other state agencies
  - UMMS (QHS, Commonwealth Medicine)
  - Boston University

- All interpretations and conclusions in this talk are my responsibility, and do not necessarily reflect the opinions of anyone from the State
Setting the Context

- State Medicaid programs like MassHealth are struggling to manage costs and care.
- One strategy they’re considering is moving from a fee-for-service (FFS) payment model to a global payment model in which money to care for the people it enrolls is transferred to each “full-service” contractor, such as: an HMO, insurance company, ACO, ...
- What is the right amount of money?
MassHealth “Programs”

- Enrollees sign up with either a Primary Care Clinician (PCC) or with a Managed Care Organization (MCO)
- In PCC, payments are FFS; in MCO, they are based on a risk model
  - Now: MCO plans are paid using DxCG relative risk score (RRS) based on age, sex, and diagnoses from claims (encounter) records
  - Goal: Add social determinants of health (SDH) information to a payment model to be used for “almost everybody” starting in 2017
Project Objectives

- We examined
  - Differences in characteristics and associated costs between PCC and MCO members
  - Can we improve predictions by adding SDH factors to RRS?

- We considered additional predictors
  - **Personal:**
    - SDH: homelessness, multiple address changes, income, education, language, race, ethnicity, income, ...
    - Disability: as a reason for Medicaid entitlement; as a client of the Dept. of Mental Health or Developmental Services
    - Selected medical conditions: asthma in kids, substance use disorders, ...
  - **Contextual (Neighborhood) SDH**
    - Based on census block groups or tracts
    - % living alone, % >age 25 w/o GED/HS, % w income < 100% FPL, ...
Study Design

- **Population**: MassHealth members enrolled for 183+ days in each of CY2011 to CY2014 in the PCC or MCO populations
  - The numbers referenced here are from CY2013

- We use **concurrent models** to predict costs (that is, 2013 patient characteristics to predict 2013 costs) from the **relative risk score** (RRS) and additional factors (as just shown)
Examining Model Performance: Looking at how well models predict for special populations

- Define model-based *predictive ratios (PRs)* for a subgroup G as

  \[ \text{PR} (G) = \frac{\text{Actual costs (G)}}{\text{Model-predicted costs (G)}} \]

- **PR > 1** when group G’s costs exceed what the model would pay (suggests underpayment for that group)

- We seek models with PRs ~ 1 for most policy-relevant subgroups

- We also look at global measures, such as “percent of variability explained” (R^2s)
## Comparing Costs (or Use) in PCC vs. MCO

**Example: Excess MCO cost per RRS unit for non-disabled members (rounded numbers)**

<table>
<thead>
<tr>
<th></th>
<th>PCC</th>
<th>MCO</th>
<th>Ratio of MCO to PCC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td>285,000</td>
<td>465,000</td>
<td>-</td>
</tr>
<tr>
<td><strong>Mean Cost</strong></td>
<td>$3,700</td>
<td>$3,800</td>
<td>1.03</td>
</tr>
<tr>
<td><strong>Mean RRS</strong></td>
<td>0.70</td>
<td>0.65</td>
<td>0.93</td>
</tr>
<tr>
<td><strong>Cost per RRS unit</strong></td>
<td>$5,286</td>
<td>$5,846</td>
<td>1.11</td>
</tr>
<tr>
<td><strong>Excess MCO Cost per RRS unit (expressed as a percent deviation from 1)</strong></td>
<td>11%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
We Can Improve the Risk Model

- RRS alone predicts total medical expense well (concurrent $R^2 = 51.6\%$ in PCC and $60.0\%$ in MCO)
- Expanded models are more accurate ($R^2$s = $56.4\%$ and $61.3\%$) and PRs closer to 1 for almost all subgroups
  - Eg, asthma in kids: PR was 1.24, is now 1.00 (0.90 in MCO)

<table>
<thead>
<tr>
<th>Disability issues</th>
<th>Medical conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMH client</td>
<td>Serious mental illness (SMI)</td>
</tr>
<tr>
<td>Not DMH but DDS client</td>
<td>Substance use disorder (SUD)</td>
</tr>
<tr>
<td>All other disabled</td>
<td>Diabetes</td>
</tr>
<tr>
<td>Housing issues</td>
<td>Asthma/COPD (Age ≥ 18)</td>
</tr>
<tr>
<td>Homeless, by ICD-9 coding</td>
<td>Asthma (Age &lt; 18)</td>
</tr>
<tr>
<td>≥ 3 addresses in a year</td>
<td>Polyneuropathy</td>
</tr>
<tr>
<td>Neighborhood risk factors</td>
<td>Schizophrenia</td>
</tr>
<tr>
<td>NSS7 [see next slide]</td>
<td>Post-traumatic stress disorder</td>
</tr>
<tr>
<td>% living alone</td>
<td>Profound/severe DD</td>
</tr>
<tr>
<td>Not able to geocode (flag)</td>
<td></td>
</tr>
</tbody>
</table>
NSS7 – A neighborhood stressor score based on 7 census variables

<table>
<thead>
<tr>
<th>NSS7 [1st Principal Component]</th>
<th>2nd Principal Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Families, income &lt;200% FPL</td>
<td>% Living alone</td>
</tr>
<tr>
<td>% Families, income &lt;100% FPL</td>
<td>Some variables that were not used</td>
</tr>
<tr>
<td>% Families with public assistance</td>
<td>% Unemployed</td>
</tr>
<tr>
<td>% Families without a car</td>
<td>% Houses that are vacant</td>
</tr>
<tr>
<td>% Single parent</td>
<td>% Crowded</td>
</tr>
<tr>
<td>% With no high school degree</td>
<td>% English language problems</td>
</tr>
<tr>
<td>% Housing, renter occupied</td>
<td>% Minority</td>
</tr>
<tr>
<td></td>
<td>% Hispanic</td>
</tr>
</tbody>
</table>
Reflections on SDH for MassHealth

- We can predict costs well with RRS alone – and better with SDH and other factors (e.g., disability)

- Surprisingly, MCOs spend more on their sickest people than similarly sick PCC members

- Models should reflect policy considerations, such as
  - We don’t currently capture “homelessness” reliably
  - Vulnerable people (e.g., non-English speakers, or people living in stressed neighborhoods) may be underserved
  - Costs of new expensive therapies (e.g. Hepatitis C cure)
  - Hard to get the price right when Ns are small and costs are both high and highly variable (e.g., profound/severe DD)
Reflections on SDH for MassHealth

- Likely trade-offs among long-term support services, housing assistance, and traditional medical costs
  - Risk models solve some problems and help identify others
  - Not easy to predict who “needs” expensive services
  - Not all problems can be solved with risk models

- The model is only a tool
  - It is “your servant” – “you are not its slave”
  - Some model coefficients (e.g., for “homelessness”) will be chosen “consistent with” – but not entirely driven by – the data
SDH MassHealth Project
Conclusions

- Risk factors, costs, and utilization of PCC and MCO members differ a lot
  - We still don’t understand why as well as we should
- We build models to encourage (and support)
  - Efficient care for everyone
  - Excellent, well-coordinated care for the most vulnerable
  - Accuracy in recording the data needed to manage care
- Good risk adjustment is *dynamic and collaborative*
  - Consult with stakeholders to build best feasible models
  - Use risk-based payment and other policy tools to improve equity and efficiency
  - Use stakeholder concerns and modeling to identify mispricing
- Good models support *both*: treating the underserved and improving the data needed to manage care
THANK YOU!

I WELCOME YOUR SUGGESTIONS AND FEEDBACK

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