Healthcare reform

Actuarial problems and solutions

MCFAM Distinguished Lecture
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April 24, 2014
Plan for today

- U.S. healthcare pre- & post-reform
- Basics of health costs from an actuarial perspective
- Past modeling approaches
- New techniques (new to health actuaries, anyway)
U.S. healthcare

$2.5 trillion in 2010

~1/6 GDP
National Health Expenditures per Capita, 1960-2010

NHE as a Share of GDP

5.2% 7.2% 9.2% 12.5% 13.8% 14.5% 15.4% 15.9% 16.0% 16.1% 16.2% 16.4% 16.8% 17.9% 17.9%

Notes: According to CMS, population is the U.S. Bureau of the Census resident-based population, less armed forces overseas.

Source: Centers for Medicare and Medicaid Services, Office of the Actuary, National Health Statistics Group, at http://www.cms.hhs.gov/NationalHealthExpendData/ (see Historical; NHE summary including share of GDP, CY 1960-2010; file nhegdp10.zip).
Distribution of National Health Expenditures, by Type of Service (in Billions), 2010

- Hospital Care, $814.0 (31.4%)
- Physician/Clinical Services, $515.5 (19.9%)
- Other Personal Health Care, $384.2 (14.8%)
- Prescription Drugs, $259.1 (10.0%)
- Other Health Spending, $407.6 (15.7%)
- Home Health Care, $70.2 (2.7%)
- Nursing Care Facilities & Continuing Care Retirement Communities, $143.1 (5.5%)

NHE Total Expenditures: $2,593.6 billion

Note: Other Personal Health Care includes, for example, dental and other professional health services, durable medical equipment, etc. Other Health Spending includes, for example, administration and net cost of private health insurance, public health activity, research, and structures and equipment, etc.

Percent Distribution of National Health Expenditures, by Source of Funds, 1960-2010

Notes: Medicare and Medicaid were enacted in 1965; by January 1970, all states but two were participating in Medicaid. Starting with 2009 NHE data, CMS revised the “Source of Funds” measure from a classification that was either public or private to one that is more program-based. CMS’s rational was that “financing arrangements have become more complex and the lines between public and private payers have become blurred as a single program may have federal, state, local, and private funding.” As a result, the category “Other Third Party Payers” includes both public and private programs and also some programs that receive funds from both public and private sources, such as Workers’ Compensation, Worksite Health Care, and School Health. “Other Pub. Ins. Programs” includes CHIP, the Department of Defense, and the Department of Veterans Affairs.

2012 population

U.S. ~ 310 million

MN ~ 5.3 million
2012 Coverage – Millions of people

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<th>Percent</th>
<th>U.S.</th>
<th>MN</th>
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<tr>
<td>0%</td>
<td>149.5</td>
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<td>20%</td>
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- Uninsured
- Other Public
- Medicare
- Medicaid
- Other Private
- Employer

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Why are health costs so high?
Pick a card, any card
Why are health costs so high?

Pick a card, any card

- Lack of information and price transparency
- Patients insulated from true cost of care
- Lifestyle issues (diet, exercise, tobacco, alcohol)
- Perverse incentives for providers (reward quantity, not quality)
- Lack of good health IT and electronic medical records
- System focused on new technology and drugs over less glamorous improvements (e.g. hand washing)
- Lack of preventive care
- Defensive medicine
What’s the distribution of costs look like?

INDIVIDUAL CLAIM DISTRIBUTION
Comprehensive Major Medical

Frequency

Claim Size
What’s the distribution for a group?

**SIMULATED SMALL GROUP CLAIM DISTRIBUTION**

Aggregate Claims: 1,000 Groups of 50 Lives
Past health actuarial models

- Rarely parametric or stochastic
- Often no more than summaries and dissections of past history + some rough guesses for “trends” to project the future
- Several broad classes:
  - Asset share models (divide a population into cells, project expected values for each cell forward)
  - Cost models and CPDs (organize cost and utilization by detailed service category for pricing)
  - Reserving models (usually simple “lag triangle” methods)
  - “Trend models” (usually simple time series based on normalized historical data)
  - Risk adjusters (generally simple linear regression models)
Why?
But we can do better!

- Rich new data, better and better computational resources
- New nonlinear toolbox, ideas from complexity theory
- Better data visualization
- Embrace uncertainty – try to predict distributions, not point estimates
In fact, we need to do better…

- Costs as % of GDP keep rising, can better analytics help solve that?

- Like addressing climate change—big dollars and politics involved

- Healthcare reform has pushed the system far out of equilibrium
Healthcare Reform

- Affordable Care Act in a nutshell
- Federal predictive model (risk adjustment)
- Other models health plans are using in a post-reform world
ACA in a nutshell

- Individual mandate with subsidies offered through new enrollment tool (Exchanges)
- New health plan rating rules
- Partially standardized plans
- Employers (51+) must offer coverage or pay a penalty
- Significant new regulatory oversight
  - Minimum loss ratios
  - Rate filing reviews
  - …and we’re just getting started

- Various sweeteners to get buy-in
  - Risk mitigation measures
  - Small employer tax credit
  - Filling in the Part D donut hole
  - Increasing Medicaid PCP payments
  - Early retiree subsidy

- Oh yeah, and a few other changes to Medicare/Medicaid
  - Medicaid expansion
  - Reductions in Medicare Advantage payment rates

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Exchanges in 2010: Great expectations
Exchanges in 2014:

Reality
Drastic times...
Enrollment progress

- Overall: about 8 million QHP signups as of April 17
- MNsure: 200,174 as of April 23
  - 50,096 in QHPs
  - Rest in MinnesotaCare/Medicaid
- Unknown:
  - How many of these folks were previously uninsured? (surveys: lots)
  - How many have paid their premiums? (95% according to MNsure)
  - How many additional signups are there off-Exchange? (lots)
  - What’s their health status? (hearing some scary anecdotes)

- Great source for data and guesses on this stuff:
  http://acassignups.net
Fundamental changes in risk

- Population shifts create great uncertainty in pricing
  - Little data on the uninsured
- Rates filed long in advance and locked in each year
  - “Bid cycle” similar to Medicare Advantage and Part D
- The “3 R’s” are supposed to mitigate this new risk…
- …but you likely won’t know if you made money in 2014 until after 2016 rates are filed!
- Upside gains are limited
- …but downside is still unlimited
3 R’s - Purpose

- Mitigate selection, pricing, and large claim risk
3 R’s: Permanent Risk Adjustment

In a state, in a market, metals vs. catastrophic

Small Group Metal Plans

Issuer A
Issuer B
Issuer C

Individual

All Metals
Issuer A
Issuer B
Issuer C

Catastrophic
A
B
C

If small group and individual markets are combined in a state, risk adjustment pools are combined.
Risk Scores Predict Plan Cost

Different predictions by metal level, including catastrophic

The same member will get a different score depending on what benefit plan they are enrolled in. Special adjustments apply to those with cost sharing subsidies.

\[ R^2 \approx 35\% \]
New actuarial problems

- Modeling population shifts / consumer behavior for rate setting and financial projections
- Revenue optimization by improving risk scores
- Cost minimization by better care management
- Provider contracting
  - Accountable care
  - Find efficient providers
  - Study referral patterns
  - Fraud, waste, abuse detection
New solutions – Population shifts

- Renewed interest in stochastic micro-simulation models (a.k.a. agent-based modeling)
- Agents = consumers, insurers, regulators, exchanges, providers

Census Microdata* + Agent Behavior + Initial Conditions
→ Monte Carlo → Distribution of Market Outcomes

*Thanks IPUMS!
New solutions – Population shifts

- Gives a way to test whether the risk mitigation measures work
- Can also explore irrationality in consumer behavior
- Free book on this by Alan Mills published by SOA
- He has one on complexity theory for actuaries too
New solutions – Care management

How to find at-risk individuals?

- Stratify population using risk scores
- Focus on acute events – who’s likely to have a hospital stay or ER visit next year? (Milliman MARA)
- Predict distribution of future avoidable healthcare costs using machine learning techniques (Milliman PRM product)
- Hidden Markov models to project distributions of future morbidity loads (Norris and Grossmiller)
Parsimony