A Satellite Account for Health in the United States

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Goal

- Talk about recent developments in satellite health account
- What is easy/hard for an org like BEA
Measurement of productivity in medical care has been a longstanding challenge.
Two basic difficulties with medical care productivity

• **We often get the industry wrong**
  – We focus on the name of the company providing the treatment (hospital, physician, pharma company). Consumers care about the condition being treated (heart disease, stroke, cancer)
  – BEA has made huge progress here.

• **We are not good at measuring outcomes**
  – Improved health, relative to the counterfactual
  – There has been some progress. This is tough stuff.
Conceptual Underpinnings

Inputs

Aggregates

Conditions

Figure 1: Depiction of Satellite Health Account

Note: The top row shows the conceptual inputs to a satellite health account: the inputs and health outcomes. The middle row shows aggregate trends in medical care and health. The lower row shows the productivity analysis. Productivity growth is determined from changes in health and medical spending.
First accounts are for the elderly*

- Data are from Medicare Current Beneficiary Survey (MCBS), 1999-2012
- Total spending, not just Medicare
- Adjustments
  - Adjust weights in TM to match TM+MA population
    - Based on health info as well as demographics
  - Move spending across categories and adjust overall totals to match national health expenditure accounts
  - All spending in real (2010) dollars

* Working on the rest of the population.
AGGREGATES

This is not too hard.
Real per capita medical spending increased $4,800 annually over this time period.

Data are age-adjusted to the 2010 population in 3 age groups.
Measuring population health

$$QALE(t) = \sum_{k=0}^{T} \text{Survival}(t + k) \cdot \text{QoL}(t + k)$$

**Survival**

Determined from life tables

**Quality of life**

Specific impairments ($X_{it}$):  
- Any ADLs (/6) and IADLs (/6)  
- Functional limitations (5)  
- Trouble seeing, hearing  
- Health limits social activity

Relate 0-100 health score to these impairments in 2000-2002 MEPS

$$h_i = \beta_0 + X_{i} \beta + \epsilon_i$$

Weight impairments over time ($X_{it} \hat{\beta}$)
Mortality in the elderly has been falling

Mortality Rate in the Elderly Population

Data are age-adjusted to the 2010 population in 3 age groups.
Quality of life scores

Lowest value ~ 0.26
Mean
Max value
Quality of life is relatively constant

Data are age-adjusted to the 2010 population in 3 age groups.
Implication: quality-adjusted life expectancy is rising.
Aggregate evaluation

Real ($2010) spending per capita

Quality-Adjusted Life Expectancy at age 65

Note: $4,800 x 18 years ≈ $85,000

Note: 1 year x $100,000/year = $100,000
DISAGGREGATING TO CONDITIONS

This is hard.
Conditions

285 AHRQ CCS’s

Clinical consultation

Impute prevalence to match self-reported prevalence in NHANES (available 1999-2012)

80 conditions (prevalence, cost) [Generally display 30 rolled-up condns]

Most are direct conditions; Some are risk factors; Some are screening

This will vary for different age groups.
## Conditions and Prevalence

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Claims</th>
<th>Calibration rate</th>
<th>Self-report</th>
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<tbody>
<tr>
<td>Ischemic heart disease</td>
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<td>Congestive heart failure</td>
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<td>Other heart disease and PVD</td>
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<td>Strokes and cerebrovascular disease</td>
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<td>Hypertension, hyperlipidemia, diabetes</td>
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<td>Lung cancer</td>
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<td>Dementia</td>
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<td>Mental health and drug/tobacco abuse</td>
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<td>Major disease of CNS</td>
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<td>Eye, ear, other disease of CNS</td>
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<td>Respiratory symptoms, COPD, asthma</td>
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<td>Pneumonia and other infectious disease</td>
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<td>Chronic renal failure or ESRD</td>
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<td>Acute kidney injury</td>
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<td>Other genitourinary disease</td>
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<td>Frailty</td>
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<td>Musculoskeletal</td>
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<td>Accidents and falls</td>
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<td>Other endocrine</td>
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<td>Gastrointestinal and liver disease</td>
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<td>General symptoms and other disease</td>
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<td>Immunizations and ID screening</td>
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<td>Screening: Breast Cancer</td>
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<td>Well care</td>
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The prevalence of most conditions is rising.

Due to prevalence and condition-specific health, the years of Quality-Adjusted Life Expectancy (QALE) have changed overall.

- Overall QALE change
- Due to prevalence
- Due to condition-specific health
Attributing spending and health outcomes (mortality + QOL) to conditions

1. Use propensity score to find people with each condition and similar people without the condition
   – Difference between two groups is first pass.

2. Adjust average and outliers to ensure spending matches national totals and fits wide distribution.

3. Reallocate spending from final conditions to risk factors (e.g., heart disease → high cholesterol)
Increase in spending per capita

- Ischemic Heart Disease
- Congestive heart failure
- Other Heart disease and vascular disease
- Strokes and Cerebrovascular disease
- Hypertension, Hyperlipidemia, Diabetes
- Lung cancer
- Colon cancer
- Prostate cancer
- Breast cancer
- Other cancers and neoplasm
- Dementia
- Mental health and drug/tobacco abuse
- Major disease of CNS
- Eye, Ear, other disease of CNS
- Respiratory symptoms, COPD, asthma
- Pneumonia and other infectious disease
- Chronic renal failure or ESRD
- Acute renal failure
- Other genitourinary disease
- Frailty
- Musculoskeletal
- Accidents and falls
- Other Endocrine (including menopause)
- Gastrointestinal and liver disease
- Hematologic
- After Care
- General Symptoms and other disease
- Immunizations and screening for ID
- Screening: Cancer
- Well Care

Most of spending increase
Cause of death differs greatly between official data and our estimates

Death Rate per 100,000
PRODUCTIVITY ANALYSIS
Key productivity assumption

• Medical spending for people with a condition affects QALE for people with that condition but not prevalence of other conditions.
  – E.g. treatment for MI affects MI QALE but not cancer incidence
  – Other than identified risk factors

• Compare estimates to simulation models
  – CVD: Ford et al.
  – Lung, colorectal cancer from SEER
  – Generally do well.
Net value of health improvement

1. Overall benefit is positive ~$110,000
   • $21%↑, 1.5%/yr

2. Largest benefit for cardiovascular disease

3. Other benefits in some types of cancers, kidney failure

4. Notable failures are mental health and musculoskeletal.

Note: Data are from the Medicare Current Beneficiary Survey with totals matching estimated national spending on the elderly. Spending is in real ($2010) dollars. The blue bar depicts improvement in health outcomes over the period, expressed in dollars. Health change is the change in QALE attributed to medical care and not changes in the prevalence of the condition. The hatched bar shows the change in medical spending. The red dot shows the net change in productivity estimate, defined as the dollar value of health improvement minus the increase in spending.
Conclusions

- Satellite accounts hold a good deal of promise for understanding the value of medical care and other interventions that affect health.

- The hardest issue for BEA is likely to be the health outcome part. There are several ways to do this:
  - Empirical measurement (like what is here)
  - Clinical trial estimates
  - Disease simulation models
  - All are worth utilizing

  - My thought: making assumptions isn’t bad. Be clear about them.