Using Clinical Information To Project Federal Health Care Spending*

Elbert S. Huang, MD MPH FACP
Assistant Professor of Medicine
University of Chicago
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Funding

• National Changing Diabetes Program
• Novo Nordisk A/S
Outline

• Describe the context within which current U.S. cost-estimating for health policy proposals occurs.

• Explore some possible enhancements that could provide policymakers with better information about health policy options in chronic disease.

• Describe new type 2 diabetes population cost model that incorporates epidemiology, natural history, and clinical trial data.
Outline

• Baseline population and cost estimates for diabetes in U.S. for 25 years.
• Sample policy simulation that examines impact of a 10-year and 25-year budget scoring window.
• Implications for Brazil.
Broad U.S. Healthcare Challenges

• Incomplete access to care
  – Private-employer based coverage
  – Government
    • Medicare-federal program for elderly, disabled, renal failure
    • Medicaid-state-federal program for the poor
  – Uninsured – 45.7 million (2008, Kaiser Family)

• Rising health care costs
Percentage of Medicare $ Spent on Chronic Illness, 1987, 1997 and 2002

The Crucial Role of the Estimators in the Legislative Budget Process

• The U.S. federal budget process depends heavily on objective assessments of both federal spending and tax receipts under alternative scenarios.

• Typically, policymakers want to know two things: what will happen under current law or baseline, and what will happen if there were a change in the law.

• Cost estimating can be a straightforward exercise, or an extremely complex one.
Developing Federal Cost Estimates

• Two primary agencies project future spending
  – Office of the Actuary (OACT) at the Centers for Medicare and Medicaid Services
    • OACT responsible for projecting future spending for Medicare
  – Congressional Budget Office (CBO)
    • Nonpartisan body that “scores” new legislation

• CBO only includes data that meets their professional standards for scientific rigor.
  – By their nature short-term costs are almost always more predictable than long-term saving.
Developing Federal Cost Estimates

• CBO also works in a required “scoring” window
  – Currently 10 years
  – Used to be 5 years

• Modeling to Predict Effects of Legislation.
  – Traditionally provider and payer focused modeling, not disease-based.
  – Clinical information is typically not included
Potential Implications of Diabetes Simulation Models

• Diabetes is an excellent chronic condition for demonstrating potential contribution clinical information can make to cost estimating.

• Natural history of diabetes has been assessed and modeled extensively over a decade.
  – The baseline progression of major complications are well documented.
  – The effect of treatment interventions are generally well understood (but evolving).
  – Multiple scientific organizations have created diabetes models (NIH, CDC, UK, and European).
Diabetes Trials and Models

• Publication of groundbreaking trials has been followed by model building
  – Diabetes Control and Complication Trial (Type 1 Diabetes) 1993
  – DCCT first trial demonstrating microvascular benefits of intensive glucose control in diabetes
  – United Kingdom Prospective Diabetes Study (Type 2 Diabetes) 1998
  – UKPDS demonstrated benefits of intensive glucose and blood pressure control in type 2 diabetes
Diabetes Trials and Models

• Longitudinal data from trials provide us with natural history of the disease
• Trials also provide us with information regarding
  – When treatments will have effects
  – How large treatment effects are
  – What complications are prevented
• UKPDS example
  – Microvascular benefits observed after 9 years of intensive glucose control
  – Mortality and cardiovascular benefits during 10 years of post-trial follow-up (metabolic memory)
Diabetes Trials and Models

• Diabetes Models
  – DCCT Research Group Type 1 diabetes model 1996
  – NIDDK type 2 diabetes model 1997
  – CDC/RTI model of diabetes complications 2002
  – UKPDS type 2 diabetes model 2004
  – Sheffield model
  – CORE diabetes model 2004
  – Eagle model
  – Archimedes model 2003

• Models designed to simulate the natural history of major diabetes complications

• Models regularly compared during the Mount Hood Challenge
The Budget Window, Disease Progression, and Effect of Treatment

Type 2 Diabetes and Glucose Control Efforts: Average Annual Complications Costs Averted - 2007$

The 10-Year “Budget Window”

Intensive Protocol

Conventional Protocol

Possible Enhancements

#1 Where appropriate, include the best epidemiologic data and modeling in baseline and intervention estimates:

– Allow the modeling of obesity trends and their interaction with chronic illness, like diabetes.
– Incorporation of consensus “lessons learned” from clinical trials.
– Challenge to the epidemiological community – be sure the data and trials meet rigorous standards for inclusion in the policy debate.
Possible Enhancements
(continued)

#2 In certain instances, look beyond the traditional 10-year budget window, if the data indicates a better understanding for policymakers.

— For most proposals a 10-year window is appropriate, but if there’s a well established natural history of the disease exceptions should be possible.

— Cuts both ways – CBO may find that for many proposal a longer window would show ballooning spending in the out years.
Figure 1:
Conceptual Model Of Costs Of Diabetes With Prevalent And Future Cohorts Over Time

- **2008 Prevalence**
  - Costs of 2008 Prevalent Cohort Age = a

- **2009 Prevalence**
  - Costs of 2009 Incident Cohort Age = b
  - Net Costs of 2008 Prevalent Cohort Age = a + 1

- **2010 Prevalence**
  - Costs of 2010 Incident Cohort Age = c
  - Net Costs of 2009 Incident Cohort Age = b + 1
  - Net Costs of 2008 Prevalent Cohort Age = a + 2
Prevalence and Incidence Modeling

Probability estimates are used to sort the population into BMI categories

BMI (along with age) influences probability of having diabetes

Body Mass Index (BMI):
- Normal (< 25)
- Overweight (25-30)
- Obese (> 30)

US Population Over Age 24

Diagnostic Categories
- Non-Diabetic
- Undiagnosed Diabetic
- Diagnosed Diabetic
- Deceased

Health care service use

Probability of progressing to disease and screening rates determine populations in these categories
Screening Rate Assumptions for Men

Males’ Screening Rates by Age and Race/Ethnicity

http://www.cdc.gov/nchs/nhanes.htm
Baseline Diabetes Population and Cost Projections
Figure 2: Projected Distribution of Newly Diagnosed, Undiagnosed and Established Cases of Diabetes, 2009-2034

Source: Diabetes Population Cost Model
Figure 3:
Projected Direct Spending on Diabetes and Its Complications for Different Cohorts, 2008-2033
Baseline Population and Cost Projections

- U.S. adult population (24-85)
  - 2009- 23.7 million people with diabetes
  - 2034- 44.1 million people with diabetes

- Direct medical costs of population
  - 2009- 113 billion (2007 US)
  - 2034- 336 billion

- Trends reflect
  - Expected demographic shift that currently is occurring with the aging of the baby boom generation
  - Current high rates of obesity.
Figure 4:
Projected Distribution of Newly Diagnosed, Undiagnosed and Established Medicare Cases of Diabetes, 2009-2034
Figure 6(a): Projected Direct Medicare Spending on Diabetes and Its Complications for Different Cohorts, 2009-2034
Medicare Baseline Population and Cost Projections

- Medicare population
  - 2009- 23.7 million people with diabetes
  - 2034- 44.1 million people with diabetes

- Direct medical costs of population
  - 2009- 113 billion (2007 US)
  - 2034- 336 billion
Figure 6(b):
Projected Real Growth – Medicare Direct Spending on Diabetes and Its Complications, Medicare Overall and GDP, 2009-2034
Policy Projections
Policy Projections

• Modeled a prototypical diabetes treatment improvement intervention that is similar to current well-designed disease management programs.

• Intensify the treatment of individuals with prevalent and incident diabetes aiming to improve
  – Glucose control
  – Blood pressure control
  – Cholesterol control
  – Use of beneficial preventive therapies (aspirin, ACEI)
Policy Projections

• $20 billion gross program spending over 25 years
• Enroll 41-64 year olds with existing diabetes
• 60,000-100,000 per year
• Assume lifelong adherence
# Diabetes Quality Improvement Intervention

<table>
<thead>
<tr>
<th>Entry Age Cohort</th>
<th>Number of patients entering treatment program each year</th>
<th>Baseline spending (no improvement intervention)</th>
<th>Improvement intervention spending</th>
<th>New spending plus cost of intervention</th>
<th>Net new spending</th>
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<td></td>
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<td>$167 billion</td>
<td>$21 billion</td>
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<td>25-year effects</td>
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<td>31-40 year old</td>
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<td>$153 billion</td>
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<td>41-50 year old</td>
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<td>$160 billion</td>
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<td>51-60 year old</td>
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<td>$21.0 billion</td>
<td>$3.7 billion</td>
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<td>10-year effects</td>
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<td>61-64 year old</td>
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</table>

Dollar amounts in 2007 $.  

Source: Derived from the authors’ own analyses/computations.
Diabetes Quality Improvement Intervention (25-year spending)

Source: Derived from the authors’ own analyses/computations.
Policy Projections

• Younger subpopulations experience greater clinical benefits and larger cost offsets
• For most age groups, program does not reduce overall spending but does generate a cost offset
• Savings from younger cohorts could partially subsidize costs of older cohorts
• Size of the offset is correlated with the budgetary window (10 years vs. 25 years) most clearly for the youngest cohorts
U.S. Budget Process Implications

- Paper highlights recent progress in the world of chronic disease modeling
- Work has been largely supported by public $:
  - Cancer (NCI-Cancer Intervention and Surveillance Modeling Network)
  - HIV (NIMH, NIAID, CDC-Cost-Effectiveness of Preventing AIDS Complications Team)
  - Obesity (CDC)
  - Neurological diseases (NINDS-Immediate Practice-Altering Clinical Trials)
- Discoveries regarding natural history of diseases and their treatments could be leveraged by cost estimators
U.S. Budget Process Implications

• Current congressional budget procedures are already moving toward a longer-term focus:
  – CBO is issuing more long-term estimates for health care entitlements
  – The Senate adopted a new rule which will require CBO to produce long-term cost estimates under certain circumstances
U.S. Budget Process Implications

• Our focus:
  – Introducing epidemiological modeling as a viable supplement to current cost estimating approaches
  – Extension of the budget window as appropriate, especially in the context of policymaking for chronic illnesses with long time horizons
  – Where there is clear and convincing data, allowing improved chronic illness cost estimating to influence budget enforcement within the current ten-year window
Implications for Brazil

• Brazilian healthcare system
  – Differs from U.S. in that health care has been a constitutional right since 1988
  – Mix of public and private insurance coverage
    • Unified Health System - SUS
    • Private insurance market

• Healthcare priorities*
  – Communicable diseases (malaria)
  – Chronic diseases (diabetes)

Implications for Brazil

• Diabetes in Brazil
  — Diabetes population estimates*
    • 1995- 5 million
    • 2025- 12 million
  — Care costs will rise with increase population size and increasingly expensive new agents

• Many of the diabetes modeling techniques discussed in these paper could be utilized in
  — Health care technology assessment
  — Budgetary planning for government agencies (SUS, Ministry of Health, Ministry of Planning Budget and Management)

Research Team

Elbert Huang, M.D., M.P.H.
Assistant Professor of Medicine
University of Chicago
(773) 834-9143 (v)
ehuang@medicine.bsd.uchicago.edu

Anirban Basu, Ph.D.
Assistant Professor
Center for Health and the Social Sciences, University of Chicago
(773) 834-1796 (v)
abasu@medicine.bsd.uchicago.edu

Michael J. O’Grady, Ph.D.
Principal,
O’Grady Health Policy LLC
(301) 656-7699 (v)
MOGrady@ogradyhp.com

James C. Capretta, MA
Principal and Director of Health Policy Consulting
Civic Enterprises, LLC
(202) 715-3494 (v)
icapretta@civicenterprises.net